LMS/PIN/N01215

Office of Legacy Management

Pinellas Environmental Restoration Project

Interim Remedial Action Plan for Source Removal at the 4.5 Acre Site

July 2008

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Acronyms and Abbreviations

bls	below land surface
cDCE	*cis*-1,2-dichloroethene
CTL	cleanup target level
DOE	U.S. Department of Energy
F.A.C.	*Florida Administrative Code*
FDEP	Florida Department of Environmental Protection
ft	feet
IRAP	Interim Remedial Action Plan
LDA	large diameter auger
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
OSHA	Occupational Safety and Health Administration
PPE	personal protective equipment
RBCA	Risk-Based Corrective Action
RCRA	Resource Conservation and Recovery Act
STAR Center	Young - Rainey Science, Technology, and Research Center
TCE	trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
UHC	underlying hazardous constituent
USGS	U.S. Geological Survey
UTS	Universal Treatment Standards
VC	vinyl chloride
VOC	volatile organic compound
yd^3	cubic yards

End of current text

1.0 Interim Remedial Action Objective

The objective of this Interim Remedial Action is to remove the source of contamination at the 4.5 Acre Site adjacent to the Young - Rainey Science, Technology, and Research (STAR) Center in Largo, Florida. The U.S. Department of Energy (DOE) plans to implement soil excavation using large diameter auger (LDA) followed by off-site disposal of the contaminated soil. DOE chose this source removal method during a feasibility study conducted in 2008 (DOE 2008); this study is summarized in Section 3 of this Interim Remedial Action Plan (IRAP).

DOE's ultimate goal at the 4.5 Acre Site is to close the site under the Florida Department of Environmental Protection's (FDEP's) Global Risk-Based Corrective Action (RBCA) rules (Chapter 62-780 *Florida Administrative Code* [F.A.C.]). These rules require removal of free product (nonaqueous-phase liquids) from the site and also require an evaluation of soils as a source of groundwater contamination during the selection of the appropriate risk-management option for site closure. For the purpose of this IRAP, contaminant source is defined as contaminant concentrations in soil that result in unacceptable contaminant concentrations in groundwater (i.e., groundwater concentrations exceeding poor water quality cleanup target levels [CTLs] as determined under the RBCA rules). This definition of contaminant source includes both nonaqueous-phase liquids and contaminants sorbed to the soil matrix.

This source removal action will affect only the source of contamination; it will not treat the dissolved-phase contaminant plumes located hydraulically downgradient from the two main source areas. However, DOE plans to add biological amendments adjacent to the source area following source removal to enhance contaminant biodegradation. This has the potential to treat any residual amounts of contaminants located in soils outside the excavation areas and decrease dissolved-phase contaminant concentrations for a short distance downgradient from the source area. This will also serve to shorten the life of the plume, but it will not affect the dissolved-phase plume located farther from the source area.

2.0 Site Description

The former DOE Pinellas Plant facility consisted of the 4.5 Acre Site and the property currently known as the STAR Center, located in Largo, Florida (Figure 1). The 4.5 Acre Site is located to the northwest of the STAR Center (Figure 2). The Pinellas Plant was constructed in the mid-1950s as part of a nationwide nuclear weapons research, development, and production complex. Production of weapons-related components at this facility ceased in September 1994. DOE owned the 4.5 Acre Site from 1957 to 1972, at which time it was sold to a private landowner. During the period of DOE ownership, the property was used for disposal of drums of waste resins and solvents. As a result of this practice, the surficial aquifer was impacted by volatile organic compounds (VOCs). Administration of DOE activities at the 4.5 Acre Site is currently the responsibility of the DOE Office of Legacy Management.

2.1 Hydrogeology

The STAR Center is located on the western coastal plain of the Florida Peninsula. The Florida Peninsula is a broad, partially submerged shelf of the Gulf of Mexico and is composed of alternating layers of sands and gravels, and carbonate deposits such as limestone. The uppermost (i.e., most recent) deposits are known as the surficial sediments and consist of silty to shelly sands. At the 4.5 Acre Site, the surficial sediments range in thickness from 25 to 31 feet (ft). The depth to groundwater ranges from approximately 3 to 6 ft below land surface (bls) but can be near land surface following significant rainfall. The saturated portion of the surficial sediments is known as the surficial aquifer. No municipal water supplies are obtained from the surficial aquifer due to the poor yield and poor quality of the groundwater.

The surficial sediments are composed predominantly of fine sand with varying amounts of silt and clay. Generalized geologic cross sections are shown in Figure 3 through Figure 5. The upper 10 to 12 ft of the surficial deposits is composed of fine to very fine sand and silty sand with traces of organic material. Sixteen soil samples collected at the 4.5 Acre Site in the summer of 2007 were analyzed for total organic carbon content, and results indicated an average value of 7,500 milligrams per kilogram (mg/kg), a median value of 3,200 mg/kg, and a range of 800 to 74,000 mg/kg. A fine, discontinuous, clayey/silty sand with variable shell content and thickness is present in the middle portion of the surficial deposits. Shell content increases with depth and may range up to 50 percent. Clay content in the surficial sands is relatively low, ranging from approximately 1 to 8 percent. At the base of the surficial aquifer, there is a discontinuous layer of clayey sand that represents the transition zone between the surficial sediments and the clays of the Hawthorn Group (Hawthorn). The Hawthorn is described later in this section.

Three man-made ponds exist in the vicinity of the 4.5 Acre Site for the purpose of collecting storm water runoff from parking lots and buildings (Figure 6). The closest pond, located immediately north of the 4.5 Acre Site on private property, was built in early 2006. Pond 5, also completed in early 2006, is located 200 ft southeast of the 4.5 Acre Site. The West Pond is located 500 ft east of the 4.5 Acre Site. The pond north of the site affects groundwater flow. The effect depends on season and recent rainfall; at times the pond recharges the aquifer, and at other times the aquifer discharges to the pond.

The surficial aquifer at the 4.5 Acre Site acts as a two-layer hydraulic system. The shallow surficial aquifer extends to about 15 to 18 ft bls, and the deep surficial aquifer extends from that depth to the top of the Hawthorn, which ranges from 25 to 31 ft bls. The tendency of shallow surficial aquifer water levels to differ from underlying deep surficial aquifer water levels, such as those observed when one zone is pumped and the other is not, indicates that a horizontal-to-vertical anisotropy exists with regard to the aquifer's hydraulic conductivity. On the basis of such observations, a representative vertical hydraulic conductivity for the aquifer is expected to be about 0.1 to 0.01 of the horizontal value. Groundwater movement between the shallow and deep portions of the surficial aquifer is likely affected by the amount of recharge from rainfall.

Groundwater flow at the 4.5 Acre Site is shown for the shallow and deep portions of the surficial aquifer in September 2007 (wet season) on Figure 7 and Figure 8 and for February 2008 (dry season) on Figure 9 and Figure 10. Groundwater flow is generally to the northwest for the shallow and deep portions of the surficial aquifer. The average hydraulic gradient across the site ranged from 0.002 to 0.003 ft/ft during the February to September period. Calculations using Darcy's Law and approximations of 1 ft/day for hydraulic conductivity and 0.3 for effective porosity indicate that the groundwater flow velocity toward the northwest was about 2−4 ft/year in September 2007 and February 2008. The hydraulic gradients and groundwater velocities are similar for the shallow and deep parts of the surficial aquifer.

The Hawthorn is an aquitard that separates the surficial aquifer from the underlying upper Floridan aquifer, which is the primary source of drinking water for Pinellas County. The Hawthorn is composed of sandy clay with some carbonate lenses in the top few feet of the formation and forms a widespread confining layer between the surficial aquifer and the Floridan aquifer. In the vicinity of the 4.5 Acre Site, the Hawthorn is about 70 ft thick and is competent and continuous; it has very low permeability, such that it severely restricts vertical groundwater flow. Studies conducted during site investigations in the early 1990s concluded that surficial aquifer contamination was unlikely to affect the underlying Floridan aquifer (DOE 1991), and the three monitoring wells at the STAR Center that are screened in the upper Floridan aquifer have shown no contamination.

As part of the characterization activities conducted at the 4.5 Acre Site during the summer of 2007, permeameter testing was used to measure hydraulic conductivity on three Hawthorn core samples, resulting in an average value of 0.0002 ft/day. Based on several investigations of aquifer properties in the general area of the site, the U.S. Geological Survey (USGS) estimated a hydraulic conductivity of 0.0001 ft/day (USGS 1999). This same USGS report suggested an effective porosity of 0.35 for the Hawthorn, but clays in general are known to have effective porosity values as low as 0.05. Water levels measured in the surficial aquifer and in the Floridan aquifer over the last few years indicate an average difference in water levels of about 7.5 ft, producing a downward gradient of 0.11 over the 70-ft thickness of the Hawthorn. Calculations using Darcy's law and the range of values listed above result in estimated downward groundwater velocities in the Hawthorn that range from 0.011 ft/year to 0.16 ft/year.

Geochemical conditions at the 4.5 Acre Site generally are moderately reducing, as evidenced by the low values of dissolved oxygen and oxidation-reduction potential. Dissolved oxygen concentrations generally are less than 1 milligram per liter, and oxidation-reduction potential values average approximately –100 millivolts, indicating iron-reducing conditions. These conditions generally are conducive to biological reductive dechlorination of the chlorinated ethene contaminants. In fact, biodegradation daughter products (such as vinyl chloride [VC] and ethene) are observed at the site, indicating that contaminant biodegradation is occurring naturally.

2.2 Historical Remediation Timeline

During a 1984 investigation of past waste disposal practices at the Pinellas Plant, DOE determined that drummed waste had been buried at the 4.5 Acre Site in about 1962 (DOE 1987). Interviews with current and former Pinellas Plant employees indicated that holes were excavated with a backhoe, a load of about 20 drums was placed into the hole, and the hole was backfilled with soil. An excavation by HAZTECH in June 1985 removed 83 drums from the subsurface. Limited soil sampling during the drum removal indicated that no contaminant source remained, so future remediation efforts focused on treating contamination dissolved in groundwater.

The drum disposal practices led to contamination of site groundwater with VOCs in two general areas, one at the east central part of the site and one at the southwestern part of the site. Contaminants identified as requiring remediation were methylene chloride, trichloroethene (TCE), *cis*-1,2-dichloroethene (cDCE), *trans*-1,2-dichloroethene, VC, toluene, and benzene. Figure 11 is a timeline showing significant events at the 4.5 Acre Site, and the following text describes the remedial actions conducted at the site.

Following drum excavation as a source removal action in 1985, the first remedial action implemented at the 4.5 Acre Site was groundwater pumping, with extracted groundwater being discharged directly to the Pinellas Plant's industrial wastewater neutralization facility. This system used seven recovery wells that were screened in the lower half of the surficial aquifer, starting at 15−18 ft bls and extending to near the bottom of the surficial aquifer at 25−28 ft bls. This system began operation in December 1988 but was shut down temporarily in January 1989 because contaminant concentrations in the discharged water exceeded permit limits. An air stripper was added to the system to treat the water prior to discharge, and this system operated from May 1990 to July 1997.

This groundwater recovery system effectively decreased the extent of the contaminant plume and significantly decreased contaminant concentrations in groundwater. The air stripper treated approximately 11,125 pounds of VOCs during its operation. However, the amount of contamination that originated at the 4.5 Acre Site is unknown because contamination in groundwater from another part of the Pinellas Plant, the Northeast Site, is included in that total. Operation of the groundwater recovery system was discontinued because the rate of contaminant mass recovery had significantly decreased, and it was believed that a more aggressive remediation system was necessary to remove the remaining contaminant mass.

The second remedial action, dual-phase extraction, operated from August 1997 to August 1999. This system consisted of 22 wells that extracted groundwater and contaminant vapors from the subsurface. These wells were screened over the entire saturated thickness of the surficial aquifer, starting at approximately 5 ft bls. Each well had a vacuum extraction tube installed to approximately 22 ft bls. The system removed approximately 185 pounds of VOCs from the subsurface during its 2 years of operation. Operation of this system was discontinued because contaminant removal rates were lower than expected.

The third remedial action, biosparging, operated from September 1999 to May 2003. The purpose of this action was to inject air into the subsurface to convert aquifer conditions from anaerobic to aerobic to facilitate biodegradation of cDCE and VC, which were the contaminants present at the highest concentrations. In addition, during aerobic biodegradation of toluene, microorganisms would produce enzymes that would cometabolically biodegrade the remaining low concentrations of TCE. The biosparge system consisted of blowers at the surface connected to three horizontal wells at 24 ft bls, one through the southwestern contaminated area and two through the eastern contaminated area.

Biosparge performance evaluations conducted in 2002 and 2003 indicated that the system had not been effective at reducing contaminant concentrations for two main reasons: (1) the small particle size of the aquifer matrix resulted in air channeling through preferential pathways, limiting air contact with most of the aquifer matrix, and (2) high oxygen demand in the subsurface prevented attainment of aerobic conditions within a realistic time frame. These evaluations also indicated that biosparge operations likely had expanded the size of the dissolved-phase plume, through either vapor-phase transport via air in preferential pathways or accelerated groundwater movement due to transient high hydraulic gradients caused by pressurization during periodic stopping and restarting of the system. Biosparge operations were discontinued in May 2003. The horizontal wells were abandoned in August 2005 by grouting the entire length of the well.

The fourth remedial action was a pump-and-treat system, started in April 2004, for the purpose of controlling the contaminant plume located near the western site boundary until a decision on a final site remedy could be determined. The system consisted of three recovery wells, each with a 20-ft screened interval, located along the western side of the site. Recovered groundwater was sent to an on-site, shallow tray air stripper for treatment. In December 2005, FDEP approved the cessation of this action and the initiation of a 2-year monitoring period to evaluate the potential for closing the site under RBCA. Subsequent monitoring showed persistently elevated contaminant concentrations potentially indicative of continuing source of contamination, so DOE conducted the source characterization activities summarized in Section 2.3 and detailed in the *4.5 Acre Site Source Characterization Data Report* (DOE 2007b). Based on the results of that investigation, DOE plans to conduct soil excavation as an interim remedial action to remove the source of contamination at the site.

2.3 Contaminant Source Removal Areas and Groundwater Plume

To investigate the potential for contaminant source remaining in the subsurface at the 4.5 Acre Site, DOE collected 1,172 soil samples from 138 soil borings installed at two areas of the site from June to September 2007. The surface area covered by the soil borings was approximately 0.3 acre. The choice of characterization technique and sampling methodology is described in detail in the *4.5 Acre Site Source Characterization Work Plan* (DOE 2007a).

The results of the source characterization are described in detail in the *4.5 Acre Site Source Characterization Data Report* (DOE 2007b) and are summarized in this section. Analytical results from the soil samples demonstrated that the following contaminants were found in multiple locations at elevated concentrations: TCE, cDCE, *trans*-1,2-dichloroethene, VC, and toluene. A statistical summary of the data is presented in Table 1.

To determine which concentrations represented a potential source of contamination, the data were compared to the default soil CTL (Table 1) based on leachability to poor quality groundwater as listed in Table II in Chapter 62-777 F.A.C. CTLs were chosen because they represent the lowest soil concentration at which a contaminant could be considered to be a source of contamination (i.e., have a negative impact to groundwater).

Plate 1 shows a plan view of the source areas and lists the area and interval of source material in each excavation cell in the source areas. Source area interval and depth to Hawthorn for each excavation cell are listed in Table 2. Thiessen polygons were applied to divide the source areas into cells that surround each soil boring. Two distinct contaminant source areas were apparent, one in the east central part of the site (termed the East Source Area) and one near the southwest border of the site (termed the Southwest Source Area). These areas generally coincide with the locations where drums were buried. Figure 12 and Figure 13 are 3D representations of the source areas. The total in-place volume of soil in the source areas is approximately 2,720 cubic yards (yd^3), of which approximately 1,130 yd^3 is within the surficial sands and the remainder (1,590 yd^3) is within the Hawthorn. Approximately 4,290 yd^3 of clean soil (<CTLs) overlies the source areas.

The plume of contaminants dissolved in groundwater as of March 2008 is shown in Figure 14. VC is the contaminant with the lowest CTL and the contaminant that is transported quickest (and therefore moves farthest) in groundwater, so the extent of VC above the 10 µg/L CTL defines the boundaries of the plume for all contaminants. The TCE and cDCE plumes are shown on Figure 15 and Figure 16. As mentioned, the source removal action will eliminate the source of contaminants but will not remediate the contaminant plume located hydraulically downgradient from the source removal areas.

3.0 Summary of Remedial Alternatives Evaluation

The 4.5 Acre Site Source Removal Feasibility Study (DOE 2008) evaluated contaminant source removal methods and concluded that soil excavation was the best choice for source removal at the 4.5 Acre Site. The three common methods of soil excavation—LDA, sloped excavation, and shored excavation—were evaluated, and LDA was chosen as the preferred method to excavate the soils in the source areas at the 4.5 Acre Site.

The LDA method has relatively minimal worker safety concerns and is the easiest, most practical, and most cost-effective method to implement for the required size and depth of excavation. The disadvantage of LDA is the approximately 10 percent of soil that remains between the auger borings, but this concern can be mitigated by using a smaller auger to remove most of this soil remaining between the larger borings. In addition to the augering, DOE plans to conduct enhanced bioremediation around the perimeter of the source areas following excavation. This will aid in removal of any small amounts of contaminant mass that may exist adjacent to the excavation areas.

Sloped excavation is not implementable due to encroachments onto the adjacent building and railroad tracks when 4:1 side slopes are used (DOE 2008). Shored excavation has significant disadvantages in that a considerable amount of cost and time (up to a year) is associated with dewatering prior to the start of excavation, and there are major concerns with the difficulty and safety of working in a small, deep excavation.

The 4.5 Acre Site Source Removal Feasibility Study (DOE 2008) also evaluated the various options for treatment of the excavated soil. Thermal desorption, land farming, and off-site disposal were chosen for detailed evaluation, and this evaluation demonstrated that off-site disposal is the easiest and safest to implement, has the fewest regulatory and permitting issues, and is the most cost-effective option.

One of the main advantages of off-site disposal is that it has the fewest schedule risks. The thermal desorption treatment rate is highly dependent on moisture content because it takes substantially more energy and holding time to vaporize the extra water. In addition, mechanical units can break down and have periods of down time, resulting in some risk to schedule. Rate of treatment for land farming is dependent on weather and concentration of contaminants in the soil. Although 14 to 28 days of land farming for each batch of materials seems conservative, the site is subject to extended periods of rain, and the time to treat could double because the soil would be covered by tarps, greatly limiting contaminant volatilization.

In summary, the results of this feasibility study indicated that the preferred method of source removal is the use of LDA combined with off-site disposal of soil. In addition, DOE plans to add amendments to enhance bioremediation of any small amounts of contaminants potentially remaining adjacent to excavation areas. The source removal design and implementation are described in detail in Section 4.

4.0 Source Removal Design and Implementation

DOE is in the process of procuring a subcontractor to conduct the source removal activities. Because of the variety of auger sizes available through the potential subcontractors and DOE's desire to allow a flexible approach to source removal activities, the exact design and method of implementation will not be known until the subcontractor is selected and their preliminary plan is finalized. Currently, selection of the subcontractor is scheduled for September 2008. Once the subcontractor's design is finalized, it will be submitted to FDEP as an addendum to this IRAP.

Therefore, for the purposes of this IRAP, this section presents DOE's best estimate of the design and implementation of LDA and off-site soil disposal for source removal at the 4.5 Acre Site.

4.1 Soil Excavation Using LDA

The LDA method involves first driving a steel casing into the ground where the augering will occur. The casing allows the augering of the soils and prevents the collapse of the surrounding soils into the boring and prevents groundwater from flowing into the boring. For the purposes of this IRAP, it is assumed that the LDA will be 5 ft in diameter. This diameter was chosen to use as an example and to estimate costs; DOE will make the final determination of auger diameter during subcontractor procurement.

Most auger borings will extend into the Hawthorn, but the steel casing does not need to be driven more than a few feet into the Hawthorn because the Hawthorn will not collapse into the uncased boring, and the amount of groundwater entering the boring from the Hawthorn should be minimal. Because depth of excavation can be controlled within the casing, the upper clean soil can be removed to the predetermined depth. The clean soil will be placed on one side of the casing, removed by front-end loaders and dump trucks, and hauled to the clean stockpile. Once the contaminated soil depth is reached, that soil will be removed and placed on the opposite side of the casing and again loaded and removed by dump truck to the contaminated soil stockpile. Once the soil is removed to the final depth, the hole is backfilled with flowable fill.

Dewatering of the excavation is not required for the augering process. The soils will be saturated when pulled from the casing, so runoff will need to be controlled with temporary containment measures. Runoff control is also required at all stockpiles by capturing the water and pumping it to an on-site air stripper. Small amounts of groundwater may need to be pumped from the casing prior to placing the flowable fill into the augered hole, and this water will also be directed to the air stripper.

Plate 1 presents an example of a potential augering layout for both the East and Southwest source areas. The drawing shows the different excavation cells and lists the source area interval and depth to the top of Hawthorn. In addition, the example 5-ft diameter auger hole pattern overlaid on the excavation cells shows how the borings would be located within the cells. Plate 2 presents the cross sections of the excavation areas showing depths of clean soil, contaminated material above the Hawthorn, and contaminated material within the Hawthorn.

Table 3 summarizes the volumes to be excavated based on the augering layout shown in Plate 1. Quantities are organized by the soil disposal type: nonhazardous, hazardous less than Universal Treatment Standards (<UTS), or hazardous >UTS material. In-place cubic yards are shown and referred to as bank cubic yards. The in-place volume is determined by calculating the area of each cell and applying the clean soil depths and contaminated soil depths and contamination levels of that cell to those holes. The loose cubic yard values include the "fluff" factor that occurs once soil is excavated and stockpiled. A fluff factor of 25 percent for the upper sandy material and 15 percent for the Hawthorn material is used. Tons are also presented and are based on a conversion factor of 1.42 tons per in-place (bank) cubic yard.

Upon soil removal to the required depth, any excess groundwater in the boring is pumped out and the hole is filled with a low strength, high slump, unreinforced concrete mixture referred to as flowable fill. As the hole fills with flowable fill, the steel casing is extracted. The flowable fill is denser than the adjacent soils and therefore keeps the adjacent soils from collapsing into the hole once the casing is removed. The auger is then moved to a nearby location, and the process is repeated until all soil is removed from the excavation area. Because the flowable fill is low strength, future excavation for site development will not be hampered. However, the flowable fill likely will prevent the auger from overlapping each hole because the casing would be deflected from vertical while being driven into the hardened fill and the relatively softer soil at the same time.

Use of the excavated clean soil as part of the flowable fill is not possible because the clean soil has a high silt content, and the flowable fill requires a clean sand (no silt) as its aggregate. Clean soil from the excavation will be left on the 4.5 Acre Site and graded out over areas disturbed by remediation after the project is complete.

4.2 Soil Remaining after LDA

Some soil will remain between the augered holes because excavation is conducted using a circular auger. This remaining soil is estimated to be 10 percent of the excavation volume and could potentially contain enough contaminant mass to act as a source of contamination to ground water. This section discusses the hydrology of the source area following LDA and describes the plan for mitigating any negative effects of the contaminants in the remaining 10 percent of soil.

It is expected that local groundwater flow processes will be affected by the installation of flowable fill in areas excavated by large auger drilling. For the most part, the flowable fill columns will tend to act as low-permeability barriers to subsurface flow, much in the manner that grout curtains impede groundwater movement, so groundwater will tend to be diverted around them. Most flowable fill columns will extend several feet into the Hawthorn, so groundwater in the surficial aquifer would tend to flow around the source areas and not under them.

Though some groundwater also has the potential to migrate between columns (i.e., within the 10 percent of total area that is not removed), pressure-induced movement of concrete slurry (before it sets up) into the pores of soil separating adjacent columns is expected to strongly limit such intercolumn flow. The net effect should be zones in which very little moving groundwater, if any, comes in contact with small quantities of residual contamination that might remain after augering.

Figure 17 illustrates the type of flow pattern that is expected at a remediation zone located in the path of groundwater migrating toward the northwest. As indicated, local diversion of flow is anticipated around the east and south sides of the remediation zone. Though some buildup of water elevation on the upgradient side of the excavated area will result from this diversion, it is likely to be limited to a few inches or less due to the limited volume of obstructed flow. In addition to groundwater movement, rainwater falling on the surface of the source areas could infiltrate into the remaining 10 percent of soil. However, as discussed above, pressure-induced movement of the flowable fill into the surrounding soil may limit this movement.

Even though most groundwater is expected to flow around the excavated areas, there is still some potential for leaching of contaminants from inside the source areas following LDA. The subcontractor will be required to use a smaller auger, such as a 6- or 8-inch-diameter auger, to remove a significant fraction of the soil remaining after LDA. Figure 18 is an example showing 6-inch diameter auger borings between 5-ft diameter auger borings. This smaller auger boring will be uncased to allow adjacent soil to collapse into the boring, resulting in removal of most of the soil remaining between the concrete columns. These augered holes will then be backfilled with flowable fill, further reducing the flow of groundwater through the source areas.

In addition, once excavation has been completed, DOE also plans to implement enhanced bioremediation in a narrow zone around the perimeter of the source areas. This will serve to degrade any small amounts of contaminant mass located outside the excavation, and may degrade some contaminants in the soil remaining between the fill columns in the source areas. The current plan is to inject Edible Oil Substrate into the surficial sands on 10-ft centers, and to use the KB-1 culture of *Dehalococcoides ethenogenes* for bioaugmentation. The design for enhanced bioremediation will be submitted along with the subcontractor's final design for excavation in an addendum to this IRAP.

4.3 Disposal of Excavated Soil

All contaminated soil will be disposed of at off-site facilities licensed to receive contaminated soils, with no on-site treatment. As determined by regulatory requirements and the disposal facility's Waste Acceptance Criteria, the contaminated soils can be segregated on the basis of contaminant soil concentrations and results of Toxicity Characteristic Leaching Procedure (TCLP) testing into the following categories:

1. Hazardous >UTS,
2. Hazardous <UTS,
3. Nonhazardous, and
4. Clean materials (<CTLs).

Material classified as hazardous >UTS will require treatment at a licensed treatment, storage, and disposal facility to Land Disposal Restriction treatment standards before disposal at a Subtitle C landfill. Material classified as Hazardous <UTS will not require treatment prior to disposal at a Subtitle C landfill. Nonhazardous material will be disposed of at a Subtitle D landfill. Clean soil will be left on site. Plate 3 presents a conceptual layout of the soil stockpiles.

As shown on Plate 3, one large pad lined with an impermeable liner will be constructed with a continuous berm around it and two interior berms, creating three separate stockpile areas for contaminated material. The pad will be constructed from existing surface material using cut-and-fill technique to create a sloped surface. A surface runoff trench will be located on the downslope side of the pad and will drain to a centrally located sump with sump pump. The pump will discharge via a double containment line to the on-site air stripper. The pad will be located so that material could be stockpiled from one side and loaded for off-site hauling from the other side to avoid equipment conflict.

Excess water will be allowed to drain from the stockpiled soil, and the stockpiles will be sampled. Samples will be analyzed using Method 8260B to determine concentrations of individual VOCs in the soil and using the TCLP method to determine waste disposal categories.

The soil will be hauled off site using highway-legal dump trucks. The trucks would exit the east side of the site and proceed north through the parking lot of the adjacent warehouse building to 118th Avenue, then east to the intersection of 118th Avenue and Belcher Road (Figure 19). Trucks would travel along a major arterial highway to the nearest interstate highway. All trucks hauling from the site would use this same haul route. Clean soils would be stockpiled separately in a non-lined stockpile area and used to grade over the site after remediation.

5.0 Health and Safety

A project-specific Health and Safety Plan will be written to address all activities (excavation, on-site treatment, backfilling), risks, and controls. Engineering controls, administrative controls, and personal protective equipment (PPE) will be used as required to keep the project workforce safe.

The soil contaminants all easily volatilize. The potential exists to excavate small quantities of contaminants at levels that exceed Resource Conservation and Recovery Act (RCRA) thresholds for hazardous waste. Consequently, all workers involved with excavation, treatment, and working within controlled areas will have 40-hour Occupational Safety and Health Administration (OSHA) hazardous waste worker training as required under 29 CFR 1910.120.

A fence around the entire work area will serve as general security to prevent public access. The area around the excavation site and contaminated material stockpiles will be controlled so that only workers and escorted visitors who meet training requirements may enter the area. Contaminant vapors will be monitored to determine appropriate levels of worker PPE. Access control points for donning and doffing PPE will be established. In addition, a decontamination pad is required for decontaminating all vehicles and equipment that leave the controlled area.

Noise levels from large equipment and generators will be monitored to ensure that workers are protected according to OSHA requirements and to ensure that the county noise ordinance is not violated. Flowable fill will be used to backfill each hole after it is excavated. If the material is mixed on site, workers must be protected from silica and fine particles used in the mix. After the material is mixed, workers will wear proper skin protection to prevent intermittent contact with the material.

Off-site soil disposal requires the temporary stockpiling of contaminated materials and loading of trucks. All truck shipments of soil will be lined and covered to prevent spills. Although most trucks have automatic mechanical tarping devices, special platforms can be built for workers to stand on to place tarps, if necessary. A specific truck route has been established with the STAR Center to minimize conflicts with site tenants (Figure 19).

The following activities and risks are associated with the soil excavation and disposal. Mitigation measures are listed in parentheses.

Physical Hazards

- Constructing stockpile pads and installing liners. Liners require seam welders and hauling of heavy materials. High winds lifting the liner material before it can be anchored also create hazards (monitor weather conditions and provide temporary anchoring of liner material).
- Interaction with heavy construction equipment (use designated roads, wear safety vests, use backup alarms).
- Underground utilities (use lockout/tagout, locate utility lines before digging).
- Abandonment of existing wells using drill equipment (requires close oversight to avoid pinch and rotating hazards).
- Working in hot, humid conditions and exposure to direct sunlight/ultraviolet radiation (take numerous breaks, drink fluids, wear long sleeves and sunscreen).
- Lightning or hurricanes (monitor weather, shut down site when lightning is within 3 to 8 miles).
- Removing and covering stockpiles daily with tarps will require working on uneven surface and involve hazards during windy days (could mitigate with mechanical system that rolls tarps up).
- Noise from casing drivers, generators, and blowers (monitor noise levels, use ear protection if needed).
- Flammable fuels used to run portable generators, vehicles, and augering equipment (use containers that meet OSHA and National Fire Protection Association requirements).
- Electrical hazards (enforce strict compliance with electrical and lockout/tagout procedures).
- Use of high-pressure (e.g., Hotsy) sprayers for decontamination of equipment and vehicles (use PPE, provide training on how to handle properly).

Chemical Hazards

- Workers exposed to volatile contaminants (monitor, use respirators if required).
- Silica exposure to workers when soils dry out and conditions are windy (control dust through application of water).

Biological Hazards

- Snakes, insects (use insect repellant, conduct routine inspections of the site).

6.0 Environmental Compliance and Waste Management

The 4.5 Acre Site is being remediated as a voluntary cleanup under a consent agreement between DOE and the State of Florida. This agreement was signed in 2001 and allows DOE to lease the property from a private owner until cleanup of contaminated groundwater in the surficial aquifer is complete. A Remedial Action Plan was developed and approved by the State in 2001 to implement the long-term cleanup of the groundwater plume. Since that time, further characterization has been conducted at the site. Both the State and DOE have suggested that, based on the groundwater and soil data, a source of contamination remains in the subsurface at the site. The State has requested that the source material be removed as an interim remedial action. According to consultation with FDEP, the main regulatory program applicable to this remedial action (source removal) is Global RBCA promulgated under Chapter 62-780 F.A.C.

DOE has prepared this IRAP in accordance with the RBCA regulations and State guidance for approval by FDEP. Chapter 62-780.680 F.A.C. lists the RBCA site closure requirements. In accordance with RBCA requirements, DOE plans to conduct a remedy for the removal of source material that is consistent with the long-term remedy, that will not adversely affect the long-term strategy, and that will facilitate cleanup of contaminants in the groundwater.

The regulations require confirmatory sampling following source removal. However, it is DOE's position that because of the very detailed source area characterization conducted and the relative accuracy of the recommended source removal technology, confirmatory sampling will not be necessary.

The IRAP will serve as DOE's permit for the source removal activity but will need to be supplemented with an additional permit for storm water management and any other necessary permits. DOE will be required to obtain a storm water permit, develop a storm water pollution prevention plan, control surface water runoff, and conduct inspections throughout the duration of remediation.

Discussions with the State have indicated that separate air permits will not be necessary because the planned actions, including excavating, stockpiling, sampling and transporting the contaminated soil, and operating an air stripper to treat runoff from stockpiles, will meet the generic unit exemption under 62-210.300 F.A.C. The State also confirmed that no ambient air monitoring is required for this project, and best management practices should be used to minimize fugitive dust emissions.

The soils will be categorized and segregated on site into three separate waste piles on the basis of current characterization data and on-site screening during excavation. The soil will be separated according to the following categories:

- <u>Nonhazardous:</u> Soil passes TCLP—existing analysis of total concentrations in soils (micrograms per kilogram [µg/kg]) is less than 20 times the leachate TCLP criteria (micrograms per liter [µg/L]). It is assumed that this soil can be disposed of at a Subtitle D landfill.
- <u>Hazardous <UTS:</u> Soil fails TCLP—existing analysis of total concentrations in soils (µg/kg) is greater than 20 times the leachate TCLP criteria (µg/L), but soil underlying

hazardous constituents (UHC) concentrations are less then than the Land Disposal Restriction UTS for soil (40 CFR 268.49); the UHC concentrations for soil are 10 times the UTS. It is assumed that this soil can be disposed of directly (without treatment) at a Subtitle C landfill.

- Hazardous >UTS: Soil fails the TCLP—existing analysis of total concentrations in soils (µg/kg) is greater than 20 times the leachate TCLP criteria (µg/L), and soil UHC concentrations are greater than the UTS. It is assumed that this soil requires treatment to below UTS concentrations before it can be disposed of at a Subtitle C landfill.

In addition to these three categories, the clean soil that overlies the source area soils will be segregated during excavation and will be spread over the disturbed areas once the source removal is completed. Clean soil is defined as containing contaminant concentrations less than default soil CTLs based on leachability to poor quality groundwater.

Stockpiled soil will be sampled and analyzed according to an approved waste analysis sampling plan. Soil disposal and need for treatment will be based on TCLP analysis and comparison of total VOCs to UTS. Analysis conducted in accordance with the sampling plan may show that the soils are nonhazardous and are suitable for disposal at a less restrictive landfill, such as a Subtitle D landfill.

A portion of the soils are currently characterized as hazardous on the basis of existing analysis of total concentrations in soils that are greater than 20 times the leachate TCLP criteria. RCRA requirements will apply to transportation and disposal of the soil. As a result of consultation with FDEP and verification that the IRAP will act as the permit, as stated above, a RCRA permit is not required, and management and storage requirements under RBCA will apply. The duration of on-site storage of the excavated soil will be defined by the subcontractor's design for excavation and soil disposal. Once a subcontractor is chosen, DOE will submit the final design to FDEP as an addendum to this IRAP. The estimated duration of the excavation project is 4–5 months, and DOE anticipates that several waste shipments will be occurring during that time. Subcontractor personnel will be required to receive training in accordance with RCRA requirements and will supply training documentation.

An air stripper will be used at both source areas to treat the groundwater generated from the augering operations and runoff from the waste piles. A permit will not be required to operate the air stripper because it meets the generic unit exemption under 62-210.300, F.A.C. The STAR Center maintains an Industrial Wastewater Discharge Permit that allows the STAR Center’s process wastewater to be combined with the site’s sanitary discharge before being discharged to the Pinellas County Sewer System, in compliance with Sewer Use Ordinance 91-26. At the STAR Center, the permit is managed in a way that requires all discharges to the STAR Center’s sanitary sewer system to meet the contaminant level requirements of the permit. All wastewater generated during treatment that is to be released to the STAR Center’s sanitary sewer must meet the contaminant levels specified in the permit, plus any additional requirements for start-up and shutdown.

The permit also requires that the STAR Center submit formal written notification to the Pinellas County Utilities 30 days before the introduction of new wastewater or pollutants to the system and 48 hours before the discharge of treated groundwater to the sewer. During the initial start-up of the air stripper, samples of effluent from the treatment system shall be taken daily for the first week for compliance monitoring. For the first week of monitoring, the subcontractor shall submit all compliance monitoring samples to a laboratory for 24-hour turnaround on the analyses. Thereafter, compliance monitoring samples shall be taken weekly.

Source removal operations will comply with County ordinances for noise and tree removal. The noise ordinance contains specific requirements that include types of noise and noise levels. Tree removal requires a permit application to be submitted to Pinellas County. The application must include a survey map of the trees to be removed, the types of trees, and diameter at breast height of each tree. DOE has submitted this information to the County and is awaiting approval to remove the trees.

7.0 Quality Assurance

Sample collection procedures, field documentation procedures, and field quality control sampling will follow the guidance in the *Sampling Procedures for the Young - Rainey STAR Center and the 4.5 Acre Site* (DOE 2006b) and the *Quality Assurance Project Plan for the Young-Rainey STAR Center and the 4.5 Acre Site* (DOE 2006a). Sampling procedures, including sampling equipment decontamination, sample containers, sample preparation, and sample handling, will be followed to ensure that samples are representative of the media from which they were collected. Quality control data reported will include laboratory blanks, matrix spike duplicates, and surrogate recoveries.

8.0 Reporting

The duration of the interim remedial action is less than 6 months. Therefore, a total of two reports will be issued for the project: an Interim Remedial Action Progress Report after 3 months of work and an Interim Remedial Action Final Report at the conclusion of the project.

In addition, the subcontractor's final design for excavation will be submitted to FDEP as an addendum to this IRAP, as discussed in Section 4. This will also include the design for enhanced bioremediation outside the source areas, as mentioned in Section 4.2.

9.0 Schedule

A schedule of activities is included as Table 4.

10.0 References

29 CFR 1910.120. U.S. Department of Labor, Occupational Safety and Health Administration, "Hazardous Waste Operations and Emergency Response," *Code of Federal Regulations,* July 1 2007.

40 CFR 268.49. U.S. Environmental Protection Agency, "Land Disposal Restrictions," Section 49, "Alternative LDR Treatment Standards for Contaminated Soil, *Code of Federal Regulations,* July 1, 2007.

DOE (U.S. Department of Energy), 1987. *Comprehensive Environmental Assessment and Response Program, Phase I: Installation Assessment Pinellas Plant*, December.

DOE (U.S. Department of Energy), 1991. *RCRA Facility Investigation Report, Pinellas Plant*, Environmental Restoration Program, Albuquerque Operations Office, Albuquerque, New Mexico, September.

DOE (U.S. Department of Energy), 2006a. *Quality Assurance Project Plan for the Young-Rainey STAR Center and the 4.5 Acre Site*, Office of Legacy Management, Grand Junction, Colorado.

DOE (U.S. Department of Energy), 2006b. *Sampling Procedures for the Young - Rainey STAR Center and the 4.5 Acre Site*, Office of Legacy Management, Grand Junction, Colorado.

DOE (U.S. Department of Energy), 2007a. *4.5 Acre Site Source Characterization Work Plan*, Office of Legacy Management, Grand Junction, Colorado, May.

DOE (U.S. Department of Energy), 2007b. *4.5 Acre Site Source Characterization Data Report*, Office of Legacy Management, Grand Junction, Colorado, December.

DOE (U.S. Department of Energy), 2008. *Pinellas Environmental Restoration Project Draft Final 4.5 Acre Site Source Removal Feasibility Study*, DOE-LM/1606-2008, Office of Legacy Management, Grand Junction, Colorado.

USGS (U.S. Geological Survey), 1999. *Hydrogeology and Analysis of Aquifer Characteristics in West-Central Pinellas County, Florida*. Open File Report 99-185.

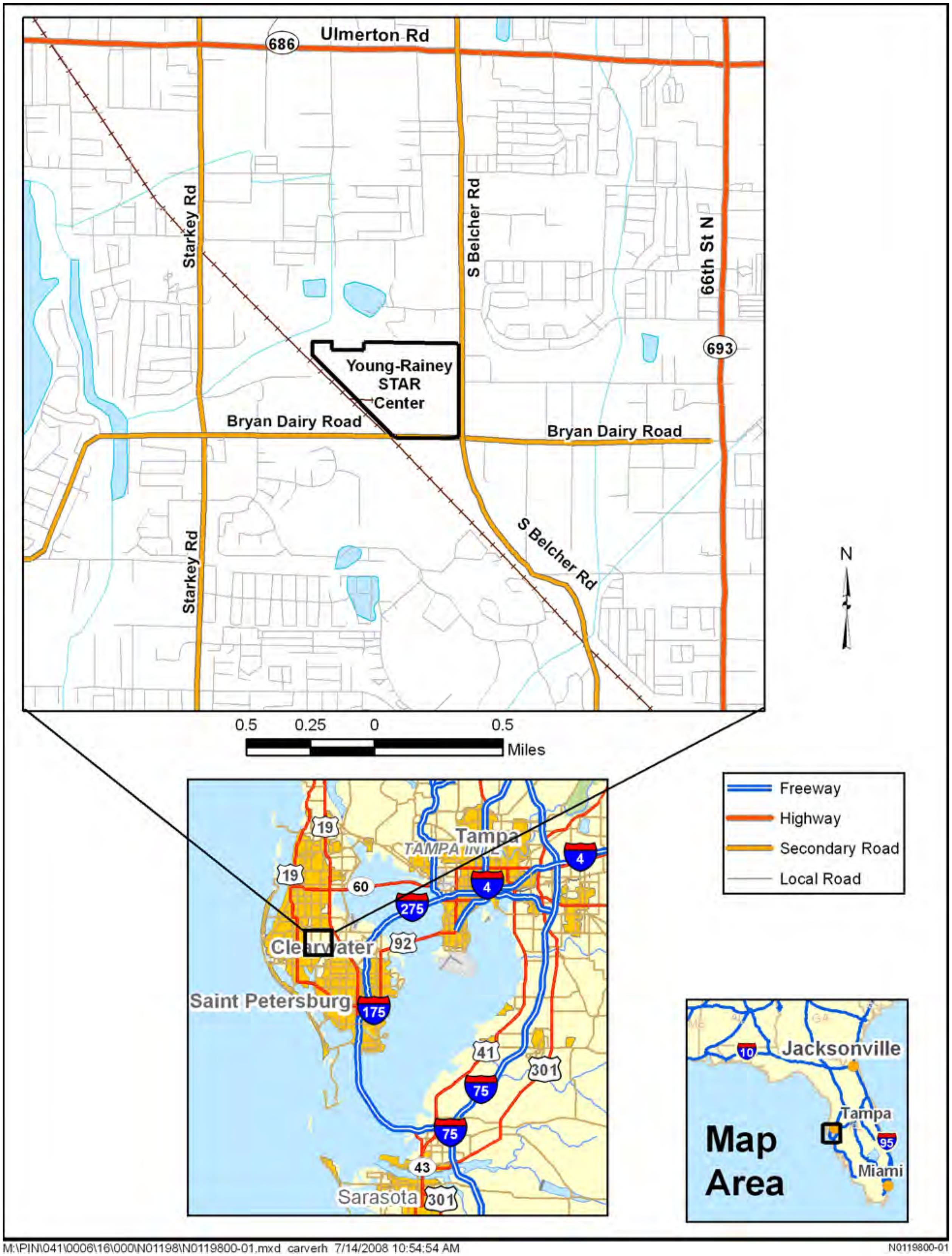

Figure 1. Site Location Map

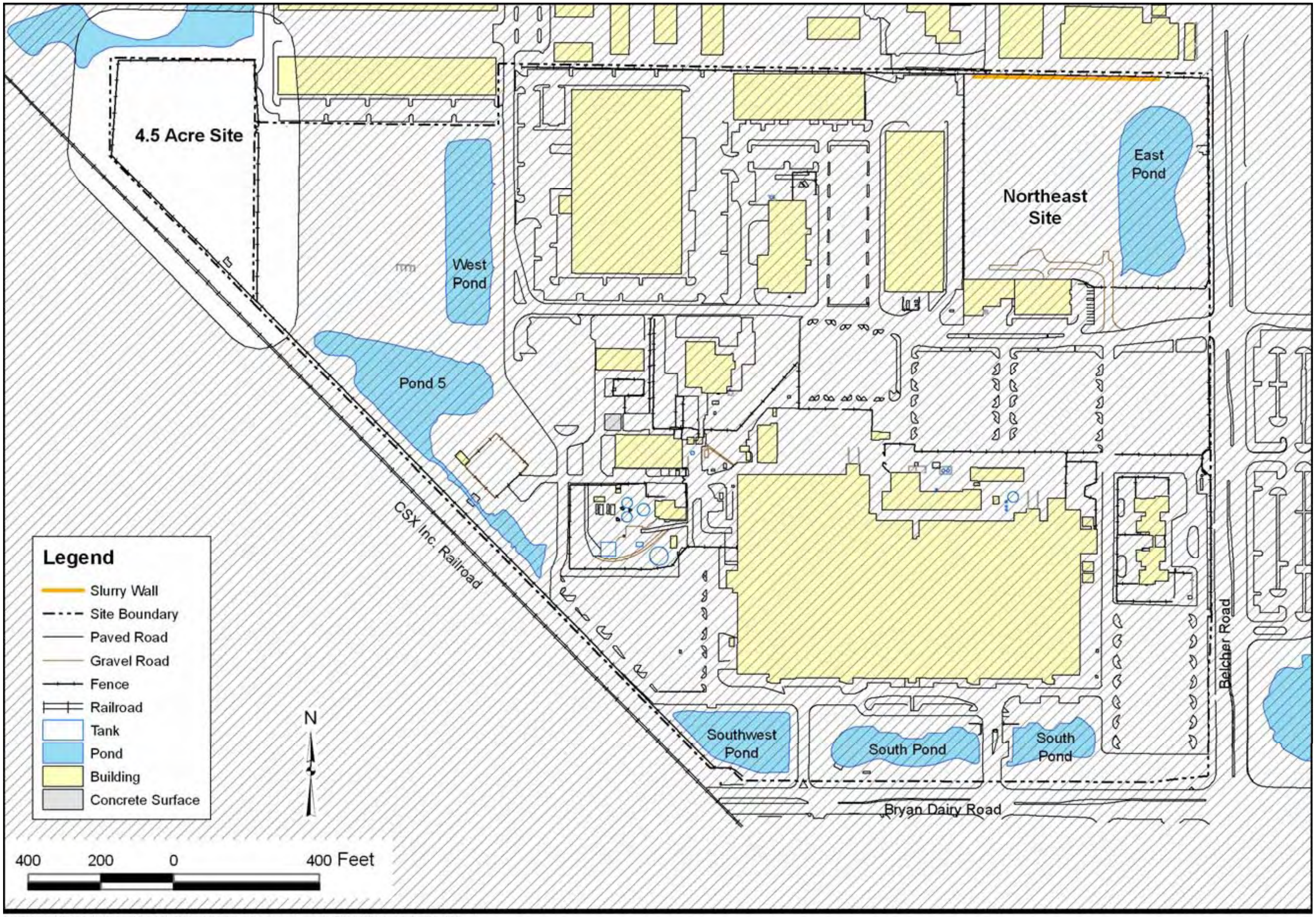

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Figure 2. 4.5 Acre Site Location

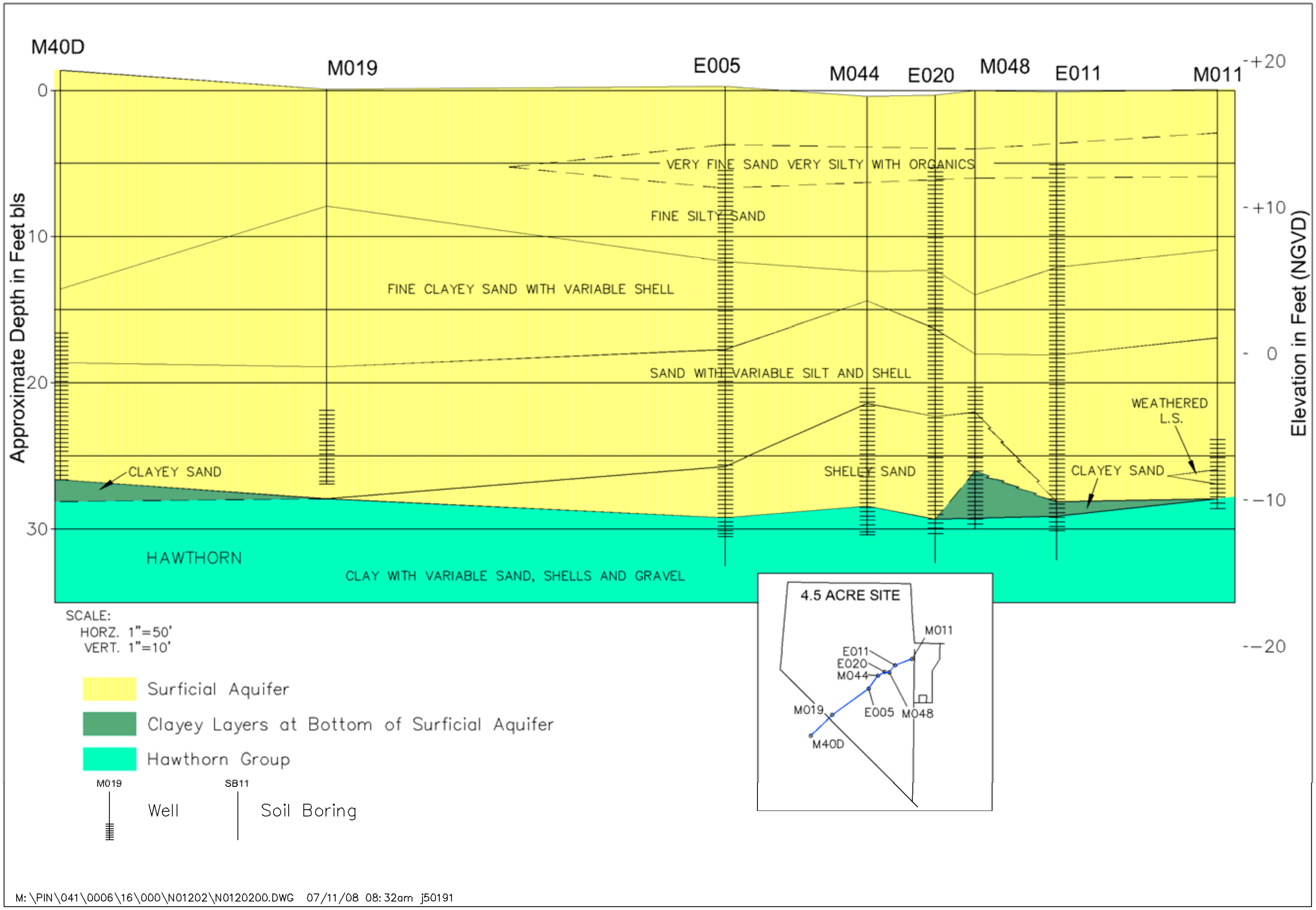

Figure 3. Geologic Cross Section East to West

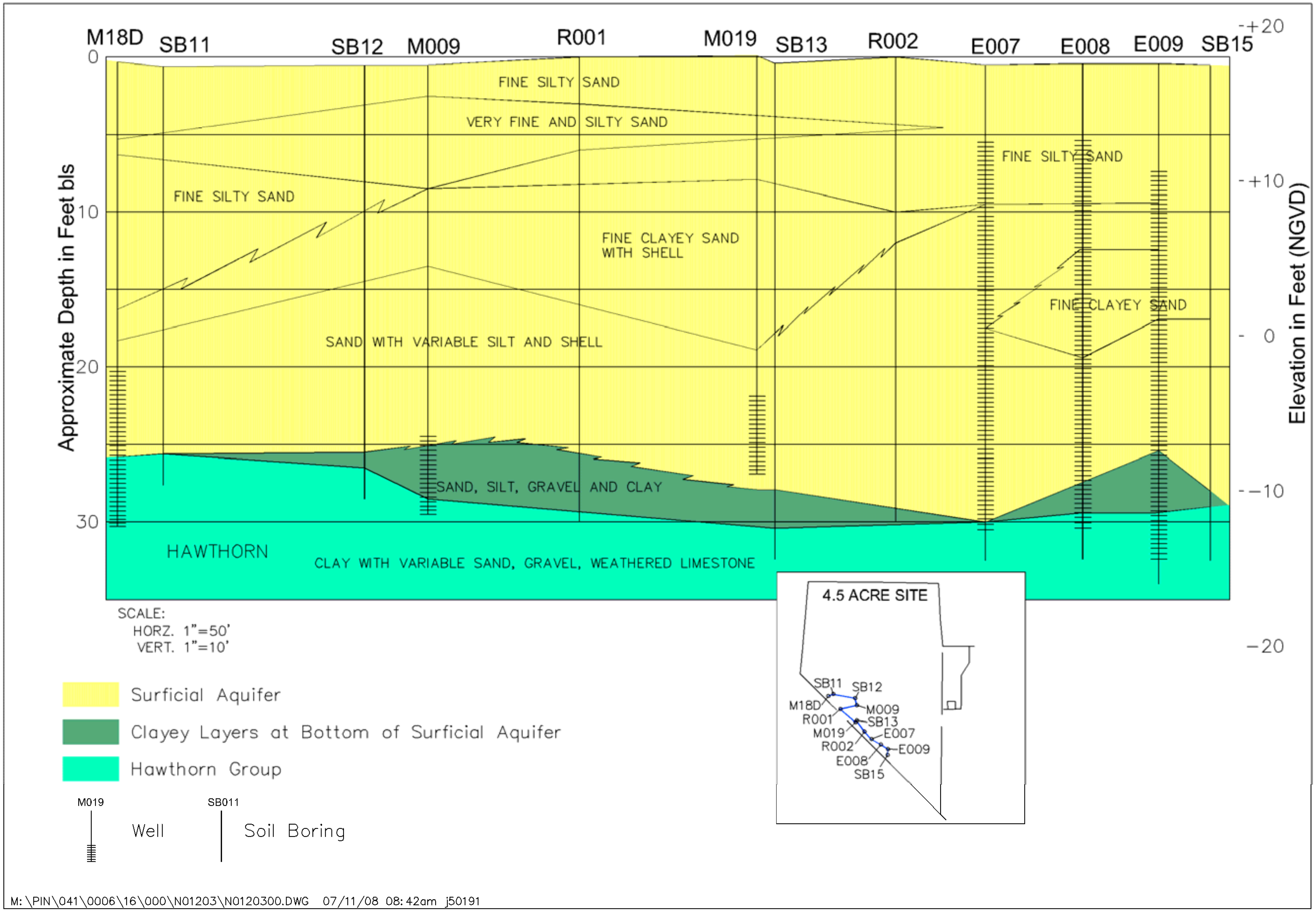

Figure 4. Geologic Cross Section West Side of Site

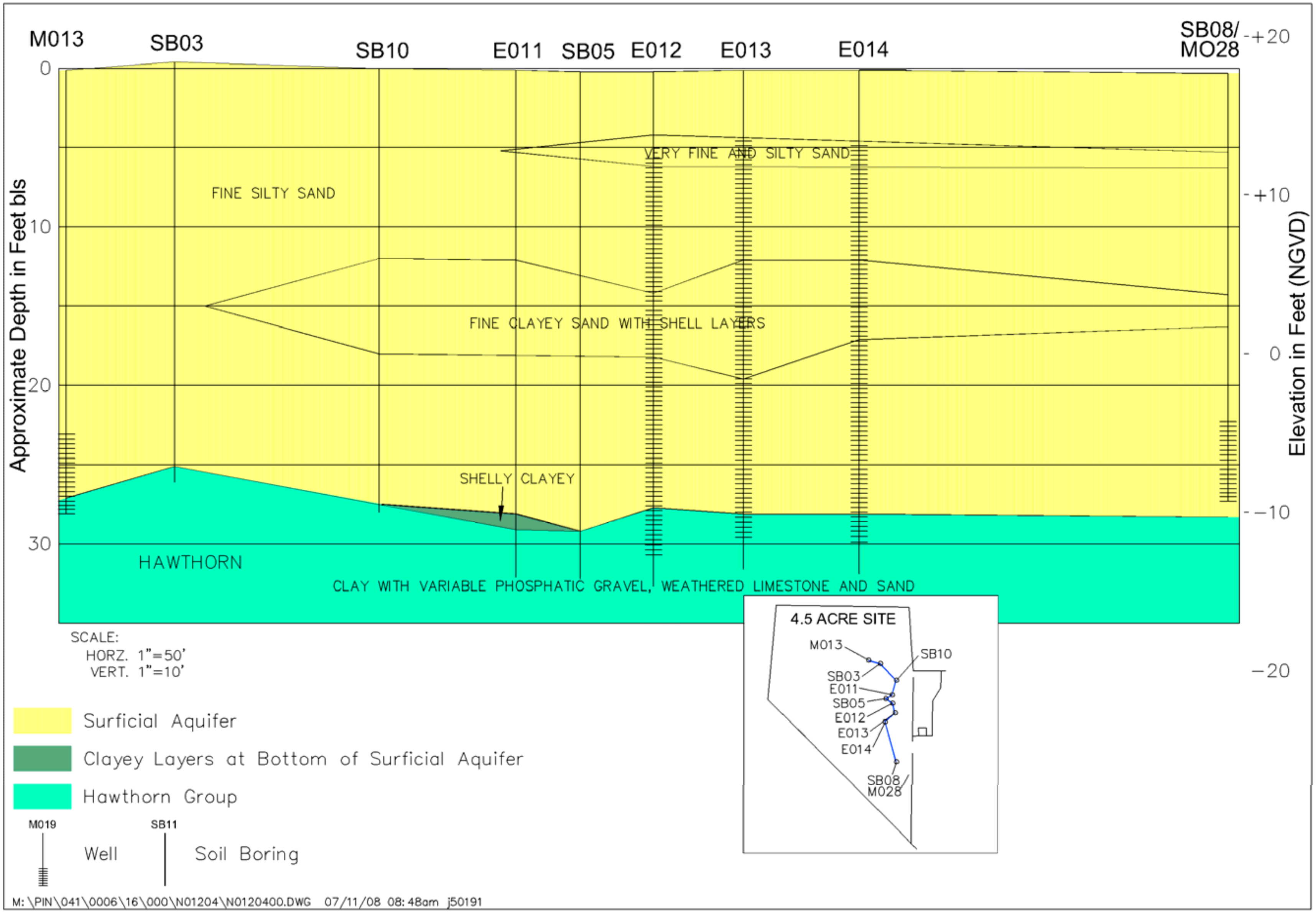

Figure 5. Geologic Cross Section East Side of Site

Figure 6. Location of the Three Ponds Near the 4.5 Acre Site

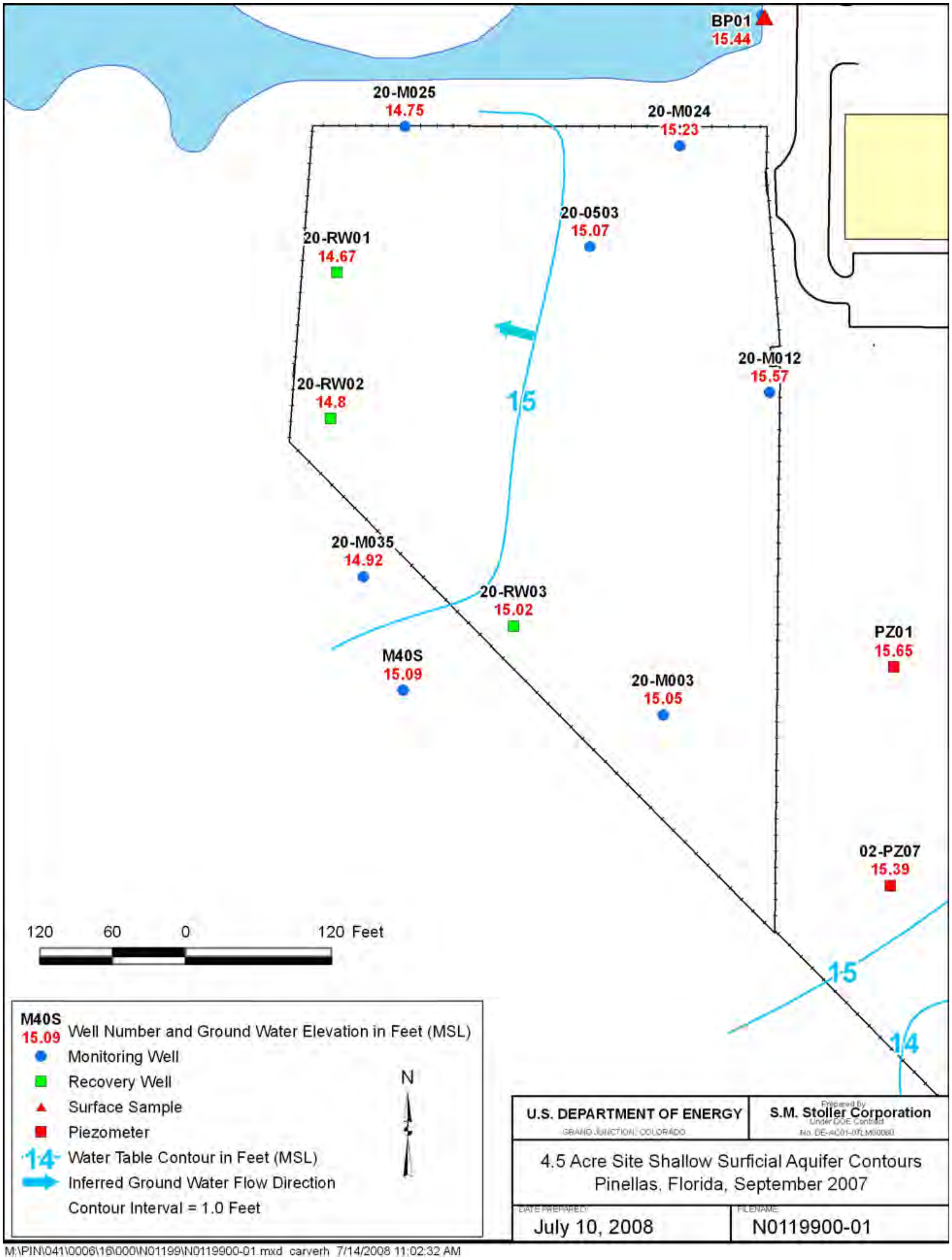

Figure 7. 4.5 Acre Site Shallow Surficial Aquifer Contours—September 2007

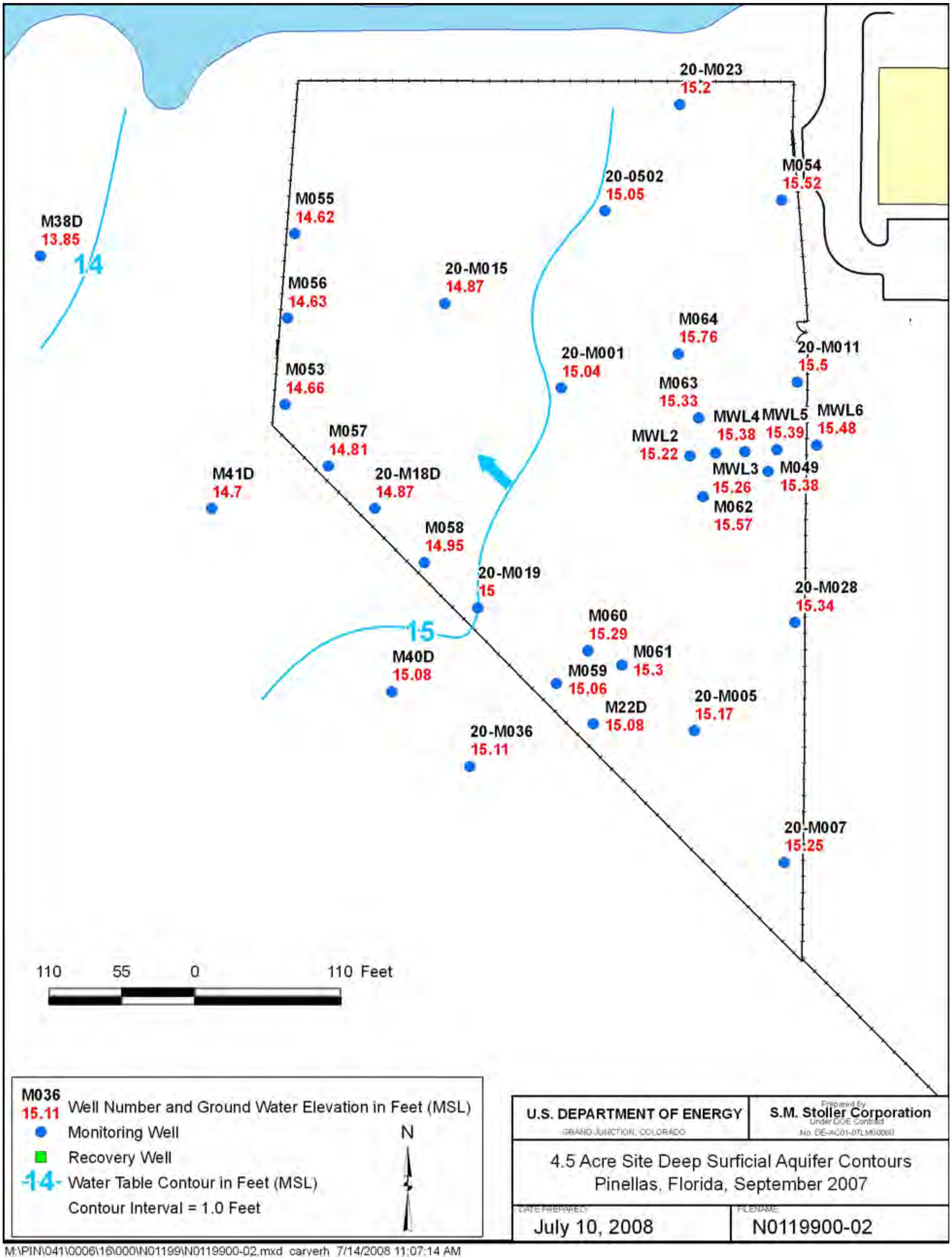

Figure 8. 4.5 Acre Site Deep Surficial Aquifer Contours—September 2007

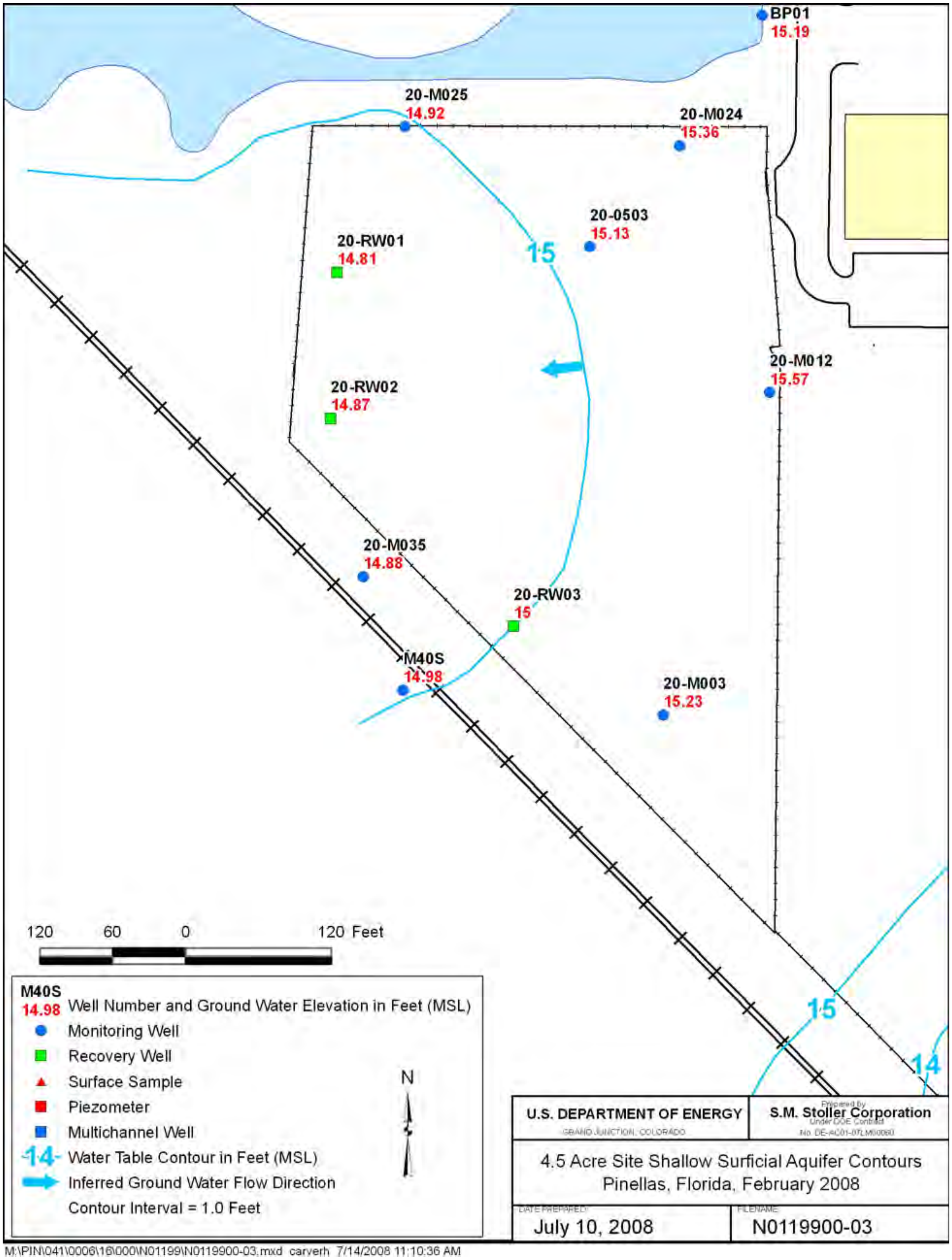

Figure 9. 4.5 Acre Site Shallow Surficial Aquifer Contours—February 2007

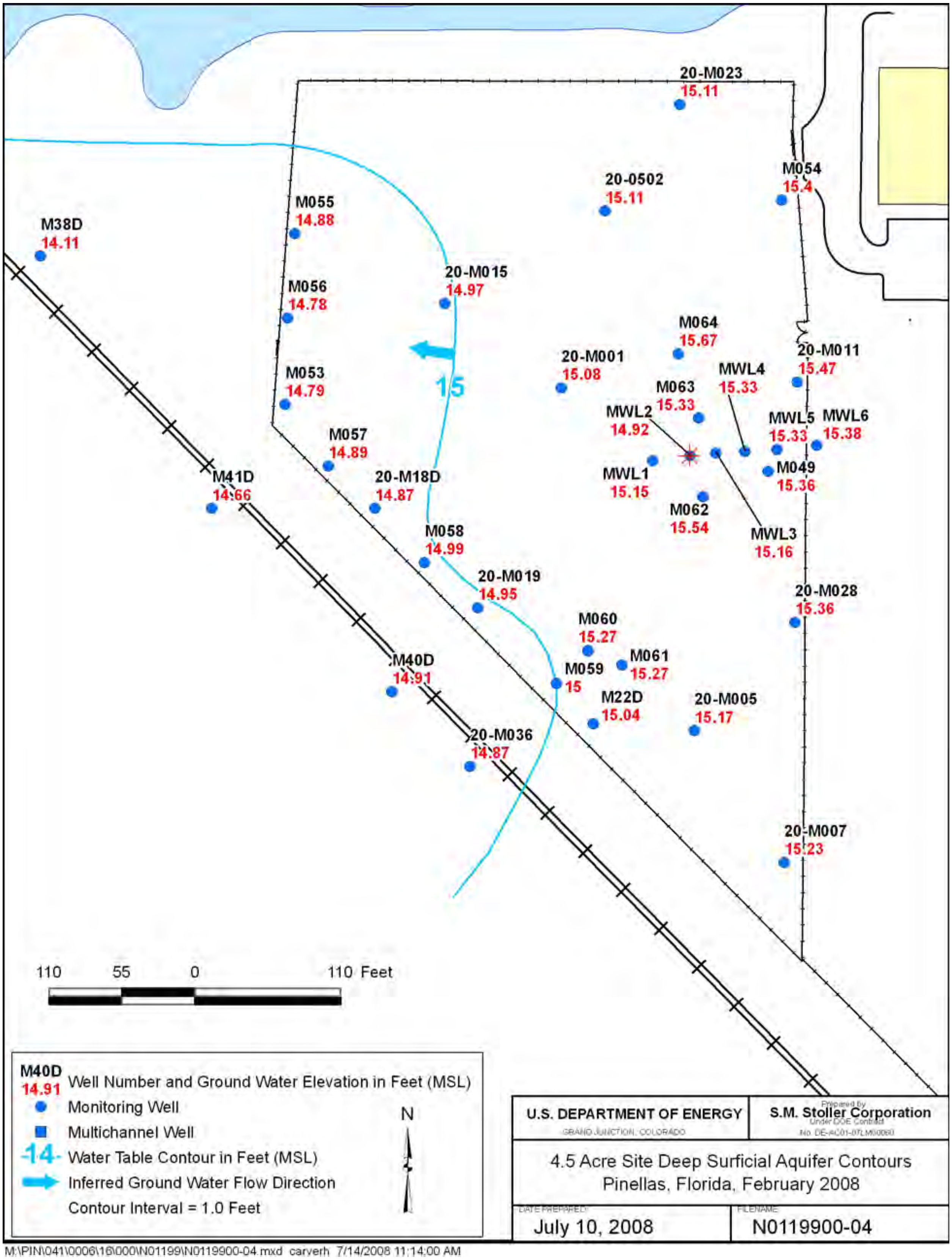

Figure 10. 4.5 Acre Site Deep Surficial Aquifer Contours—February 2007

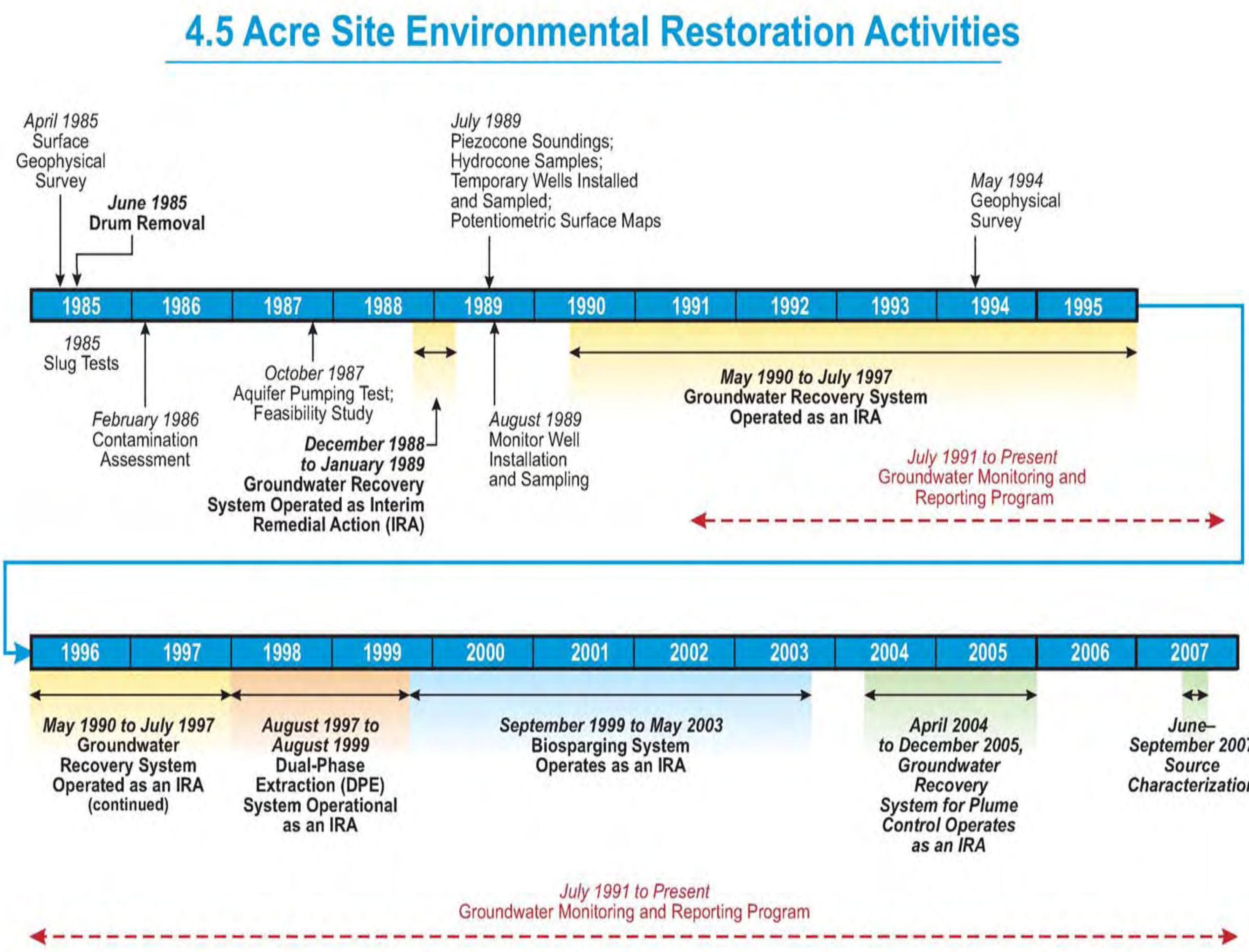

Figure 11. 4.5 Acre Site Environmental Restoration Activities Timeline

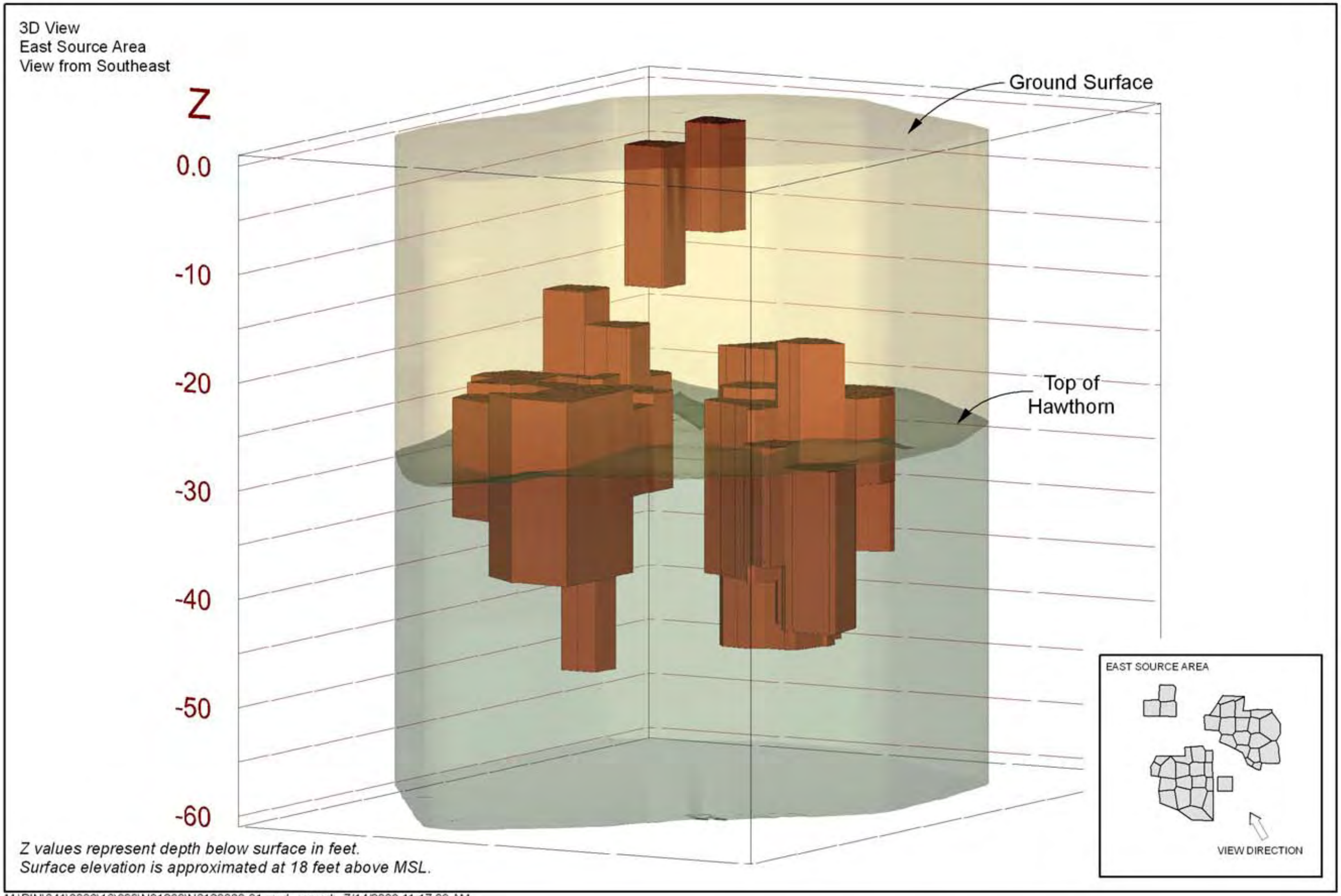

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Figure 12. 3D View of the East Source Area

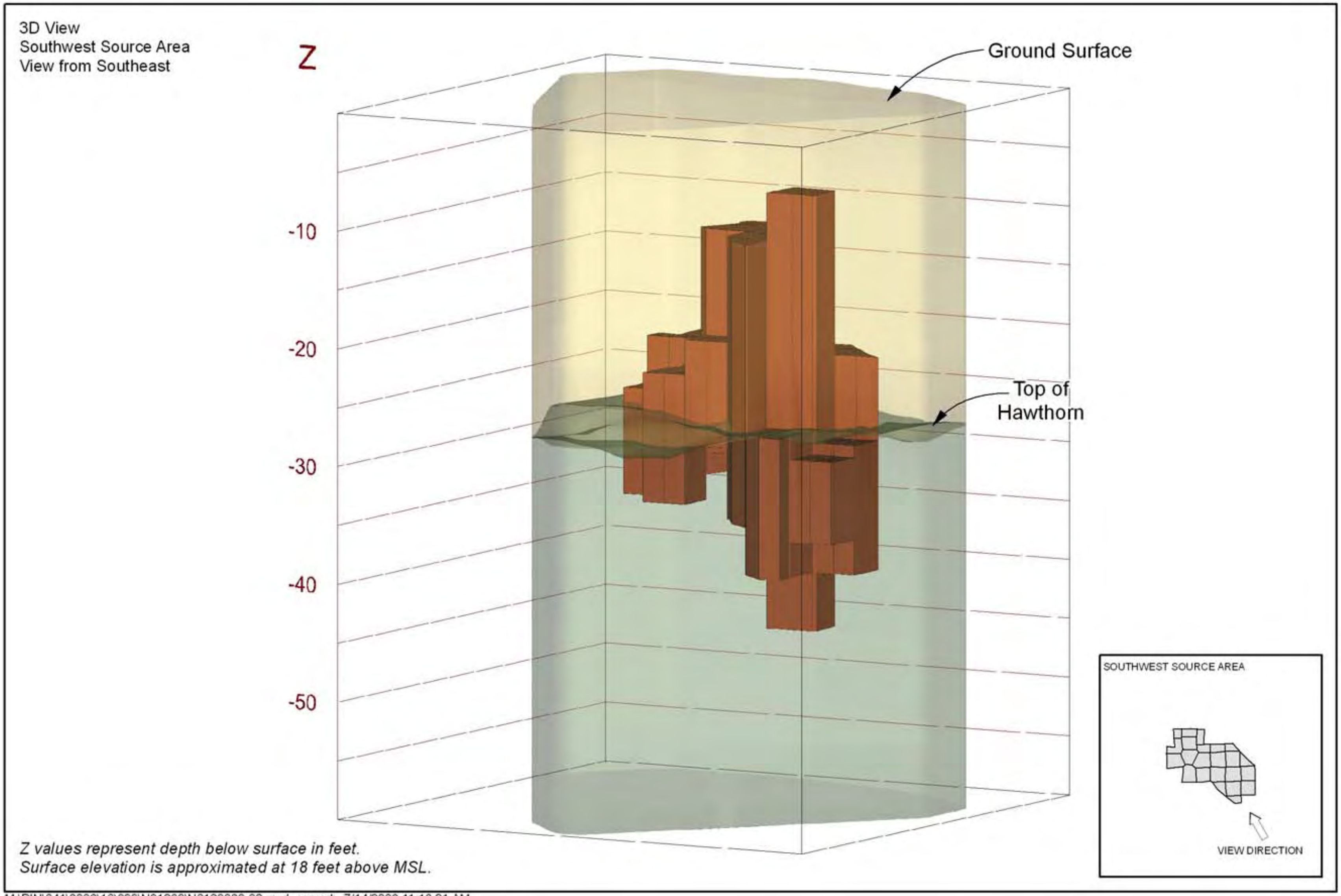

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Figure 13. 3D View of the Southwest Source Area

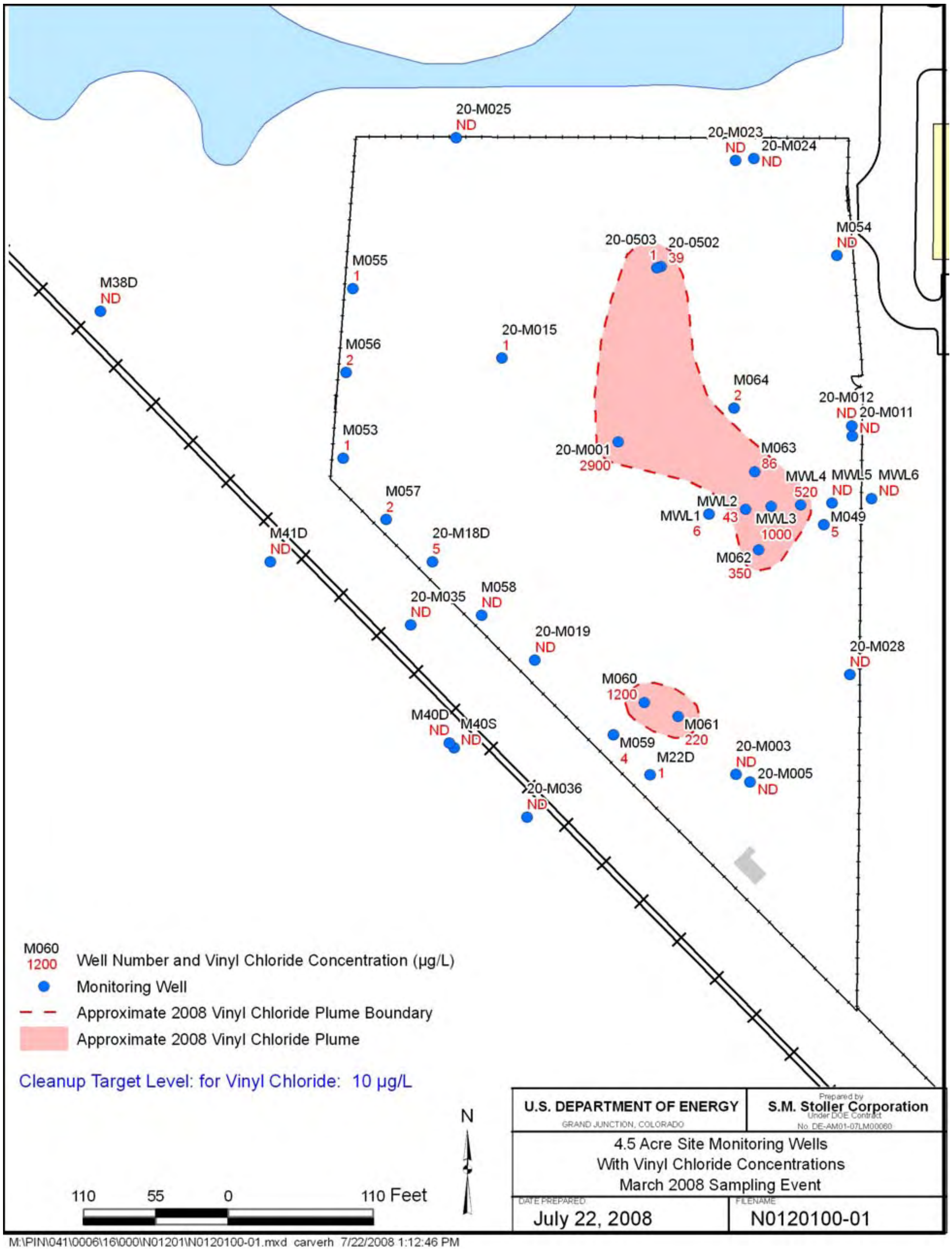

Figure 14. VC Plume, March 2008

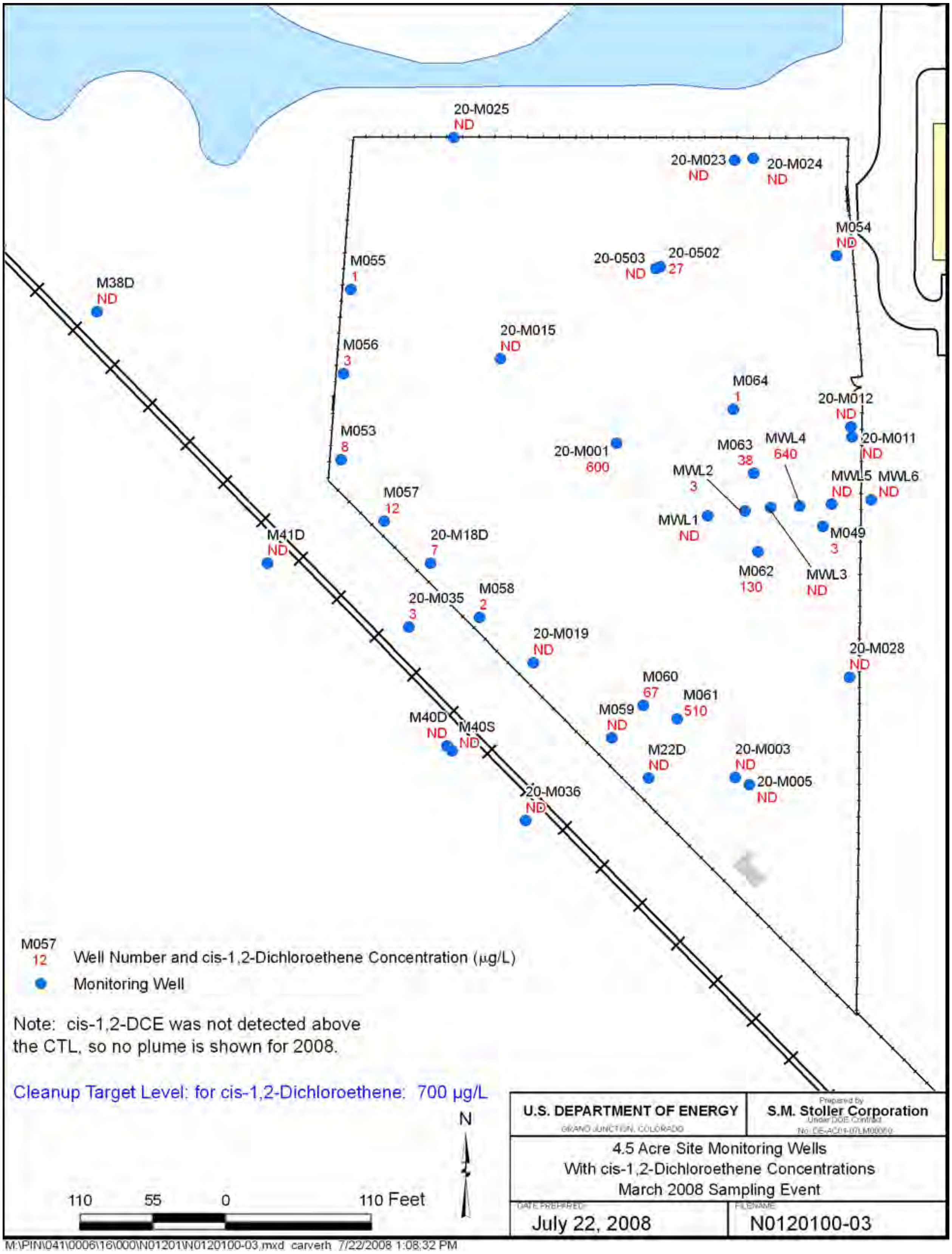

Figure 15. cDCE Plume, March 2008

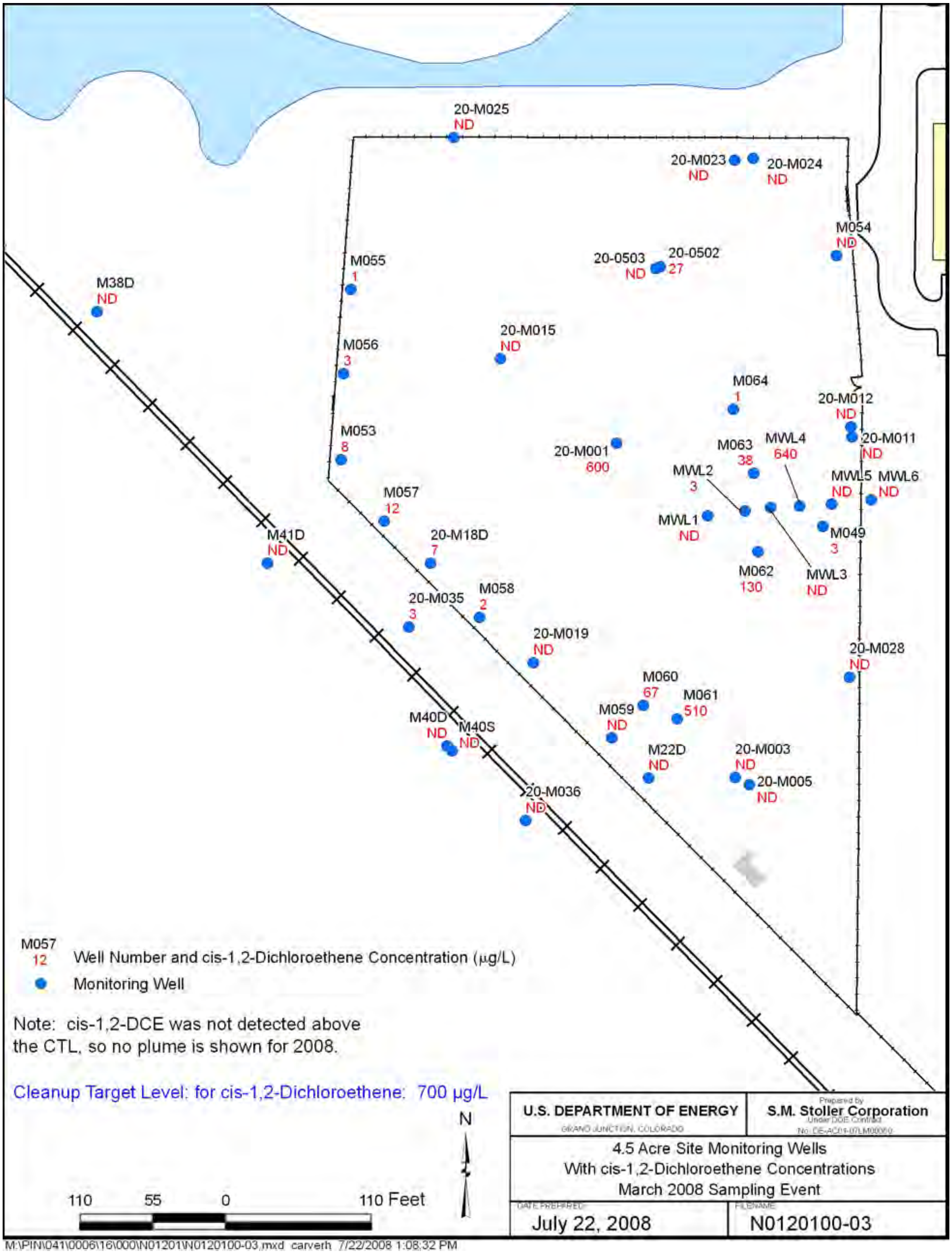

Figure 16. TCE Plume, March 2008

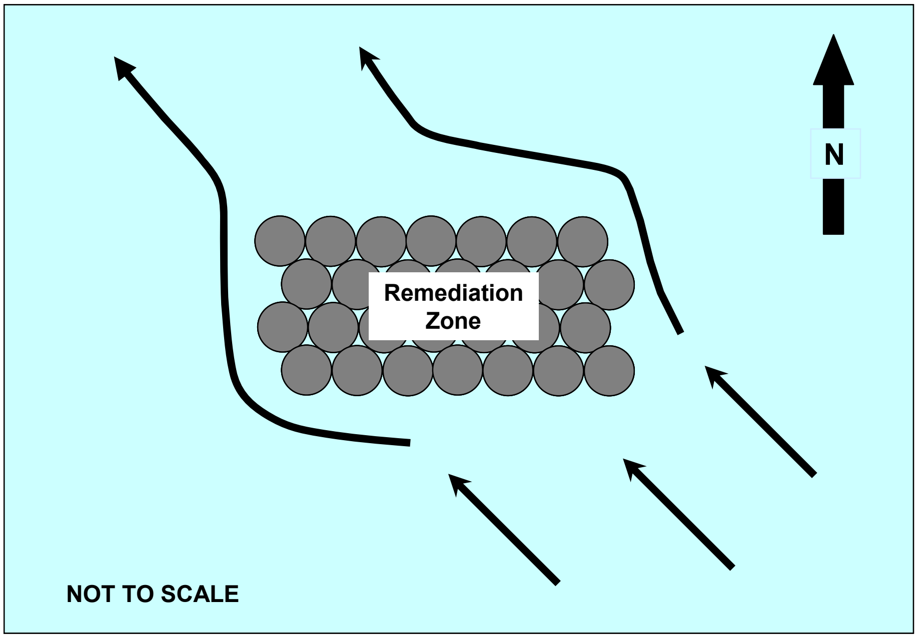

Figure 17. Map View of Expected Flow Patterns Near a Zone of Flowable Fill Columns

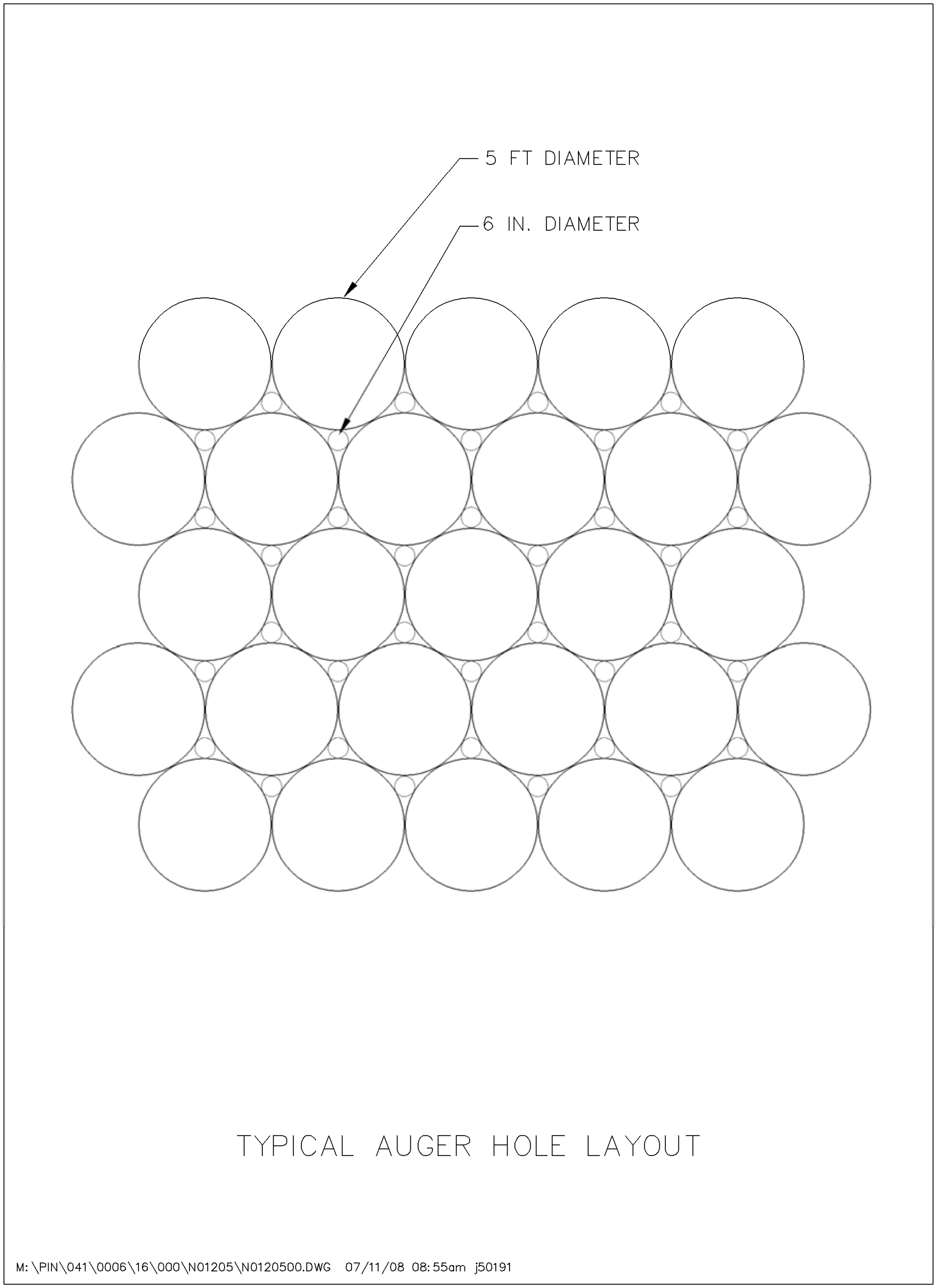

Figure 18. Typical Auger Hole Layout

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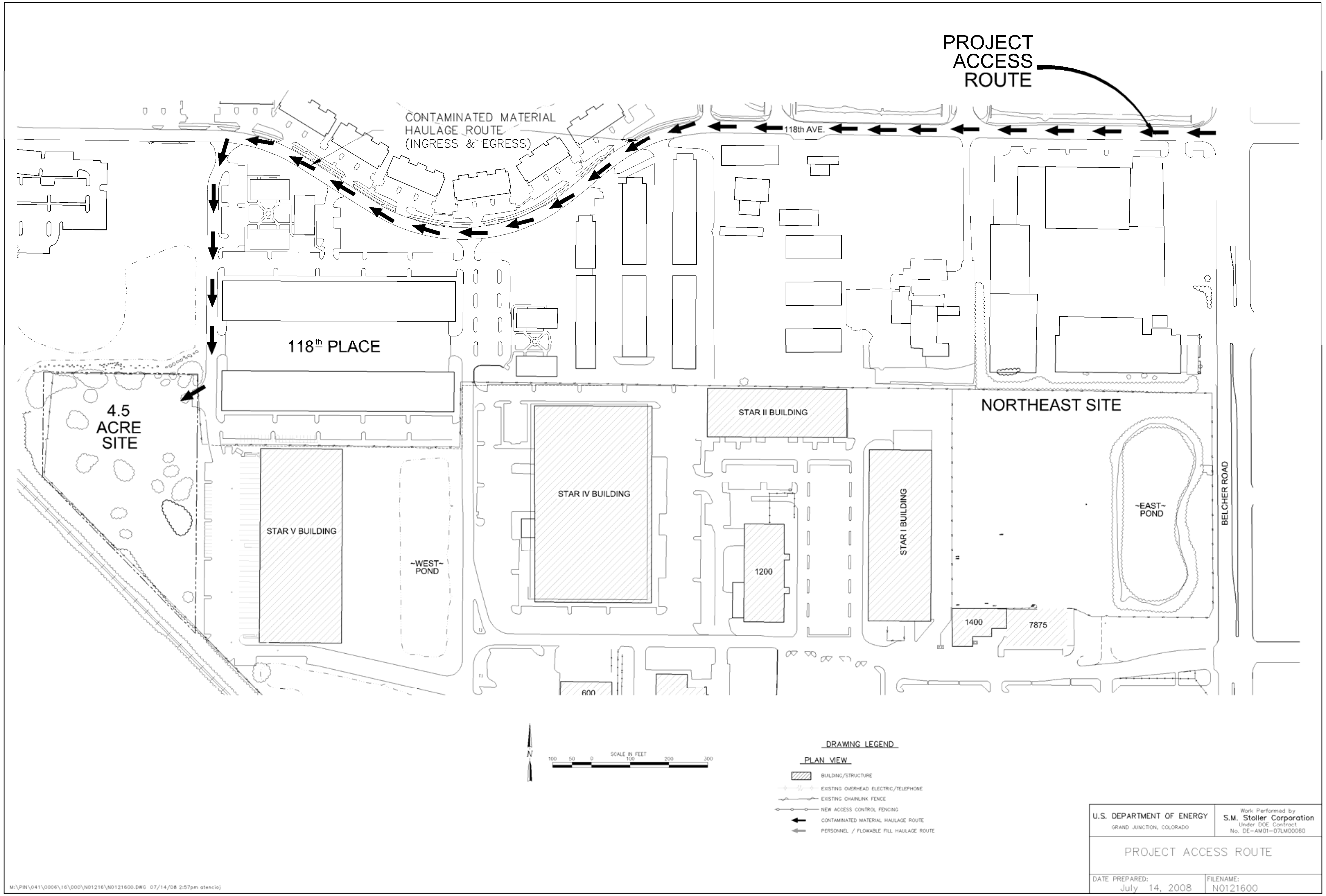

Figure 19. Source Removal Access/Haul Route

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Table 1. Summary of Data for Detected Analytes
Table is arranged by frequency of detection. Units are µg/kg. Duplicate samples were not included in the values in this table.
Nondetect values are not included in the statistics.

Analyte	CTL	Maximum Detected Concentration	Average Detected Concentration	Median Detected Concentration	Number of Detections Out of 1,172 Samples	Number of CTL Exceedances Out of 1,172 Samples	Location of Maximum Concentration	Depth of Maximum Concentration (ft bls)
cDCE	4,000	1,400,000	18,508	56	297	43	SB022 and SB074	27 and 26
VC	70	420,000	3,336	60	233	103	SB022	27
TCE	300	10,000,000	137,231	17	122	42	SB125	26
trans-1,2-Dichloroethene	7,000	24,000	749	89	67	2	SB034	27
Toluene	5,000	1,000,000	26,695	120	53	7	SB074	26
Methylene chloride	200	1,500	49	4.8	42	1	SB034	40
Trichlorofluoromethane	330,000	420	52	6.1	9	0	SB074	34
Benzene	70	5.1	1.8	0.5	5	0	SB003	25
1,1-Dichloroethene	600	280	92	75	5	0	SB125	12
Total xylenes	2,000	3.7	3.0	3.7	2	0	SB045	28
Chloroform	4,000	32	32	32	1	0	SB019	24
Tetrachloroethene	300	4,200	4,200	4,200	1	1	SB020	4
cis-1,3-Dichloropropene	20	3.9	3.9	3.9	1	0	SB033	4

Table 2. Source Area Intervals and Depth to Hawthorn

East Area					Southwest Area			
Grid Label	Depth to Top of Source Area (ft bls)	Depth to Bottom of Source Area (ft bls)	Depth to Hawthorn (ft bls)		Grid Label	Depth to Top of Source Area (ft bls)	Depth to Bottom of Source Area (ft bls)	Depth to Hawthorn (ft bls)
E-01	25	30	27.5		SW-01	22	30	27.0
E-02	17	25	24.8		SW-02	22	30	27.0
E-03	20	27	27.5		SW-03	22	30	27.0
E-04	21	31	26.6		SW-04	22	30	27.0
E-05	21	31	26.6		SW-05	22	30	27.0
E-06	21	31	26.6		SW-06	12	31	27.0
E-07	24	48	27.0		SW-07	12	29	29.0
E-08	24	39	29.0		SW-08	22	40	28.2
E-09	0	10	28.5		SW-09	26	35	26.5
E-10	24	48	28.0		SW-10	24	33	28.0
E-11	24	48	27.8		SW-11	12	31	26.3
E-12	24	39	29.0		SW-12	12	29	29.0
E-13	24	32	28.7		SW-13	22	40	28.2
E-14	25	41	28.6		SW-14	22	40	28.0
E-15	25	41	28.6		SW-15	24	35	26.6
E-16	19	45	27.3		SW-16	21	30	27.5
E-17	25	41	28.0		SW-17	12	36	25.0
E-18	28	39	28.0		SW-18	8	45	27.7
E-19	30	45	27.7		SW-19	29	40	28.0
E-20	28	39	28.0		SW-20	12	36	28.0
E-21	28	39	28.0		SW-21	28	40	28.5
E-22	23	32	27.5		SW-22	30	37	28.2
E-23	23	33	28.0		SW-23	28	40	28.5
E-24	24	33	28.4					
E-25	24	33	28.4					
E-26	23	32	27.5					
E-27	23	32	27.5					
E-28	24	32	27.3					
E-29	25	33	28.8					
E-30	25	33	28.8					
E-31	23	32	28.8					
E-32	23	37	28.0					
E-33	23	49	28.0					
E-34	23	40	28.0					
E-35	0	13	28.2					
E-36	24	35	30.0					
E-37	25	37	30.0					
E-38	23	40	27.5					
E-39	23	40	27.5					
E-40	23	40	29.0					

Table 3. Large Diameter Auger Soil Volumes and Weights

	Total Volumes		
	In-Place Volume B.C.Y.[a]	L.C.Y.[b]	Tons
Nonhazardous			
Surficial Material	595	744	844
Hawthorn Material	1,007	1,158	1,428
Total Nonhazardous:	1,603	1,903	2,272
Hazardous <UTS			
Surficial Material	186	233	264
Hawthorn Material	132	152	187
Total Hazardous <UTS:	318	384	451
Hazardous >UTS			
Surficial Material	352	440	499
Hawthorn Material	478	549	677
Total Hazardous >UTS:	829	989	1,176
Total Contaminated Material:	2,750	3,276	3,898
Total Noncontaminated Material:	4,330	5,413	6,138
Total Volume:	7,080	8,689	10,036

[a]Bank cubic yards
[b]Loose cubic yards

Table 4. Interim Action Schedule

Action	Schedule
Regulatory and Permitting	July 1−September 30, 2008
Site Preparation (including subcontractor procurement)	July 1−September 30, 2008
LDA Subcontractor Procurement	June 1−September 30, 2008
Excavation and Soil Disposal	January−July 2009[a]
Demobilization	August 2009

[a]There is a 3-month gap between the end of subcontractor procurement and the start of excavation because the LDA technology will be implemented at the Northeast Site before the 4.5 Acre Site. The procurement for LDA work includes both sites.

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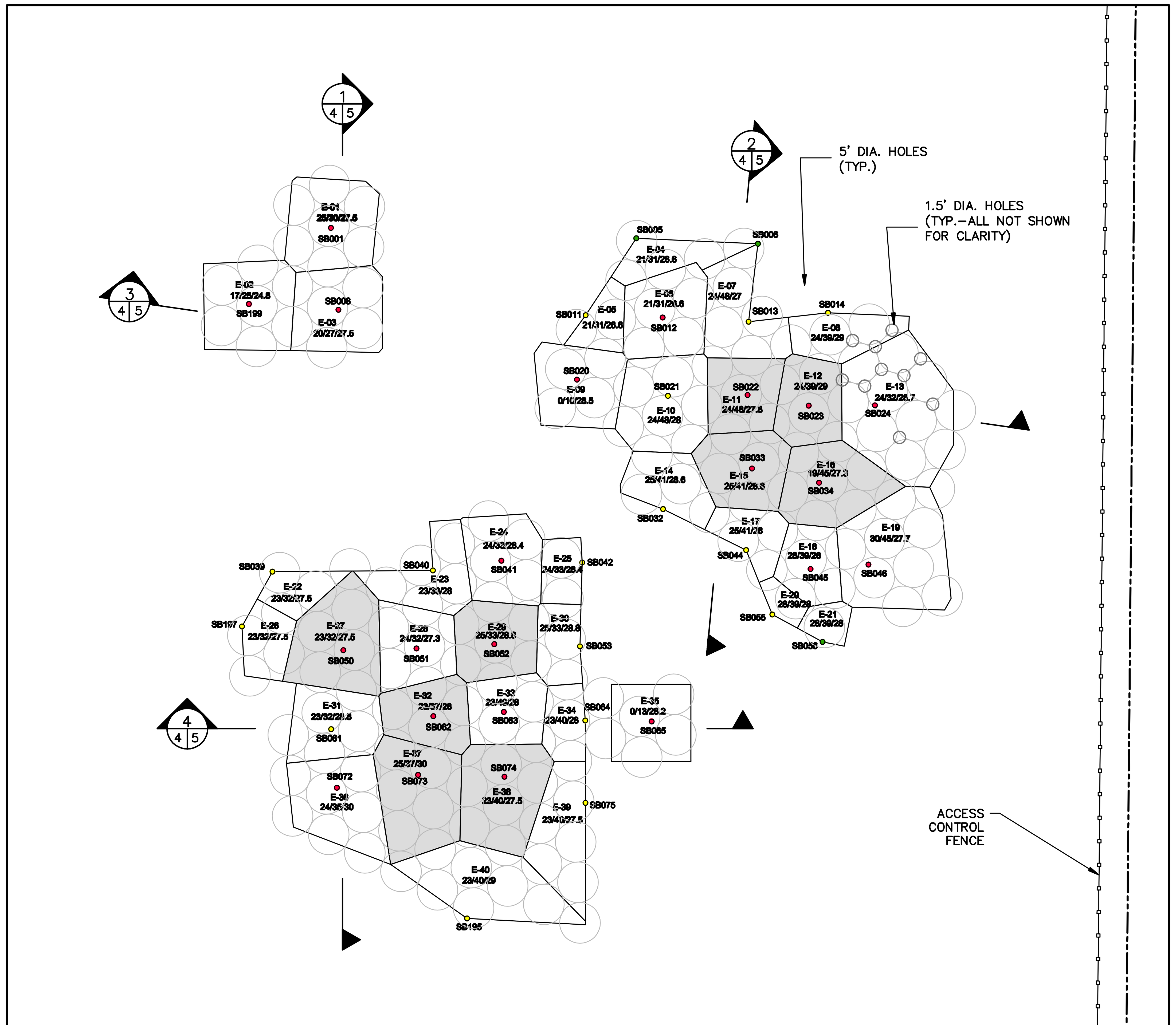
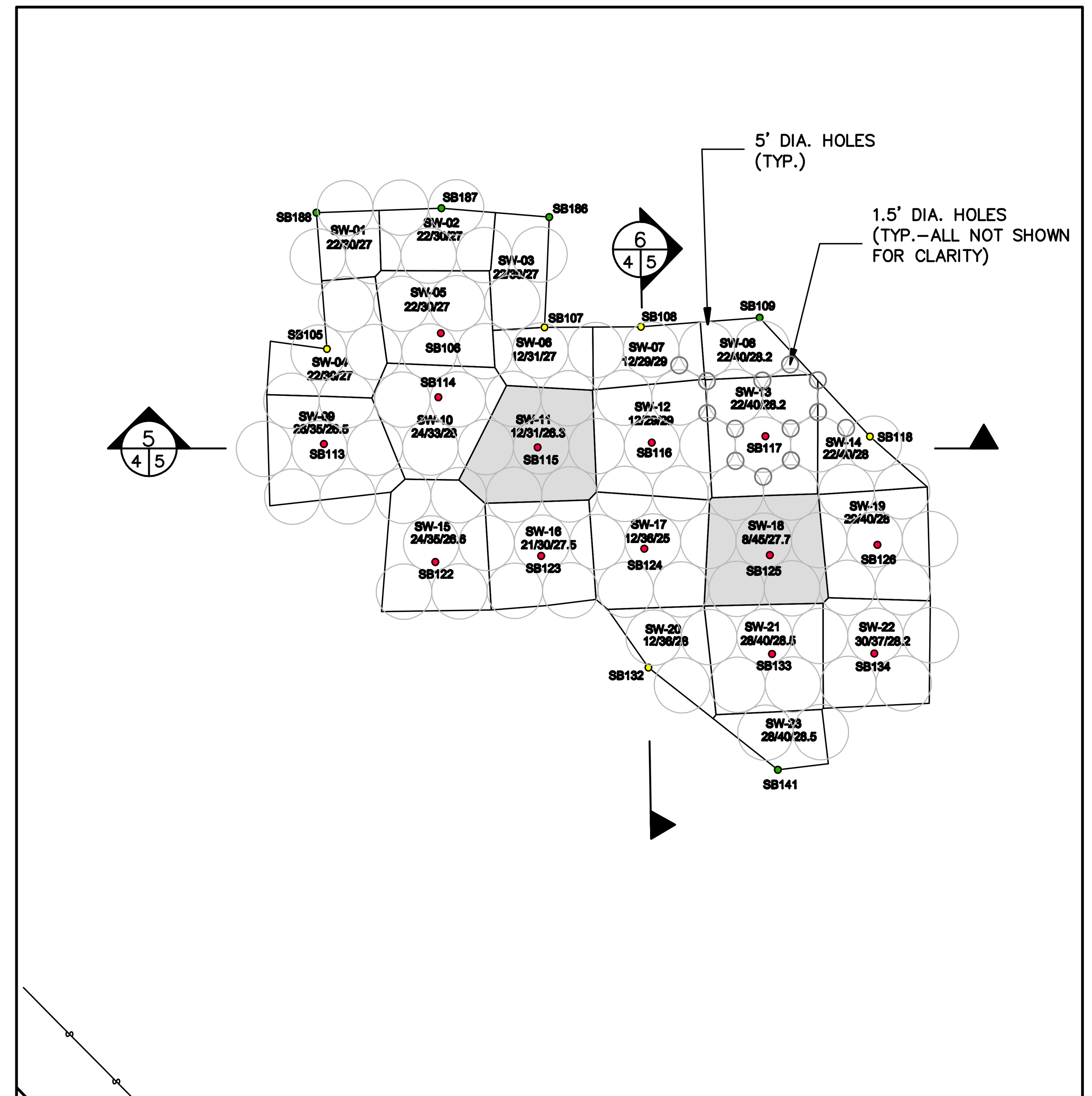


EAST REMEDIATION AREA



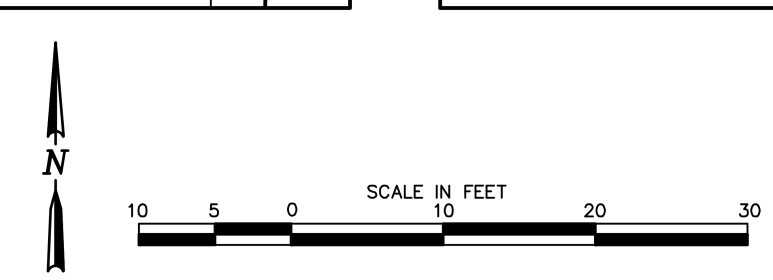
SOUTHWEST REMEDIATION AREA

GRID LABEL	Depth to Top of Source Area (ft bls)	Depth to Bottom of Source Area (ft bls)	Depth to Hawthorn (ft bls)	Soil Disposal Designation
E-01	25	30	27.5	Nonhaz
E-02	17	25	24.8	Nonhaz
E-03	20	27	27.5	Nonhaz
E-04	21	31	26.6	Nonhaz
E-05	21	31	26.6	Nonhaz
E-06	21	31	26.6	Haz < UTS
E-07	24	48	27.0	Nonhaz
E-08	24	39	29.0	Nonhaz
E-09	0	10	28.5	Haz < UTS
E-10	24	48	28.0	Nonhaz
E-11	24	48	27.8	**Haz > UTS**
E-12	24	39	29.0	**Haz > UTS**
E-13	24	32	28.7	Nonhaz
E-14	25	41	28.6	Nonhaz
E-15	25	41	28.6	**Haz > UTS**
E-16	19	45	27.3	**Haz > UTS**
E-17	25	41	28.0	Nonhaz
E-18	28	39	28.0	Haz < UTS
E-19	30	45	27.7	Nonhaz
E-20	28	39	28.0	Nonhaz
E-21	28	39	28.0	Nonhaz
E-22	23	32	27.5	Nonhaz
E-23	23	33	28.0	Nonhaz
E-24	24	33	28.4	Nonhaz
E-25	24	33	28.4	Nonhaz
E-26	23	32	27.5	Nonhaz
E-27	23	32	27.5	**Haz > UTS**
E-28	24	32	27.3	Nonhaz
E-29	25	33	28.8	**Haz > UTS**
E-30	25	33	28.8	Nonhaz
E-31	23	32	28.8	Nonhaz
E-32	23	37	28.0	**Haz > UTS**
E-33	23	49	28.0	Nonhaz
E-34	23	40	28.0	Nonhaz
E-35	0	13	28.2	Haz < UTS
E-36	24	35	30.0	Haz < UTS
E-37	25	37	30.0	**Haz > UTS**
E-38	23	40	27.5	**Haz > UTS**
E-39	23	40	27.5	Nonhaz
E-40	23	40	29.0	Nonhaz

GRID LABEL	Depth to Top of Source Area (ft bls)	Depth to Bottom of Source Area (ft bls)	Depth to Hawthorn (ft bls)	Soil Disposal Designation
SW-01	22	30	27.0	Nonhaz
SW-02	22	30	27.0	Nonhaz
SW-03	22	30	27.0	Nonhaz
SW-04	22	30	27.0	Nonhaz
SW-05	22	30	27.0	Nonhaz
SW-06	12	31	27.0	Nonhaz
SW-07	12	29	29.0	Nonhaz
SW-08	22	40	28.2	Nonhaz
SW-09	26	35	26.5	Nonhaz
SW-10	24	33	28.0	Nonhaz
SW-11	12	31	26.3	**Haz > UTS**
SW-12	12	29	29.0	Nonhaz
SW-13	22	40	28.2	Haz < UTS
SW-14	22	40	28.0	Nonhaz
SW-15	24	35	26.6	Nonhaz
SW-16	21	30	27.5	Nonhaz
SW-17	12	36	25.0	Haz < UTS
SW-18	8	45	27.7	**Haz > UTS**
SW-19	29	40	28.0	Nonhaz
SW-20	12	36	28.0	Nonhaz
SW-21	28	40	28.5	Nonhaz
SW-22	30	37	28.2	Nonhaz
SW-23	28	40	28.5	Nonhaz

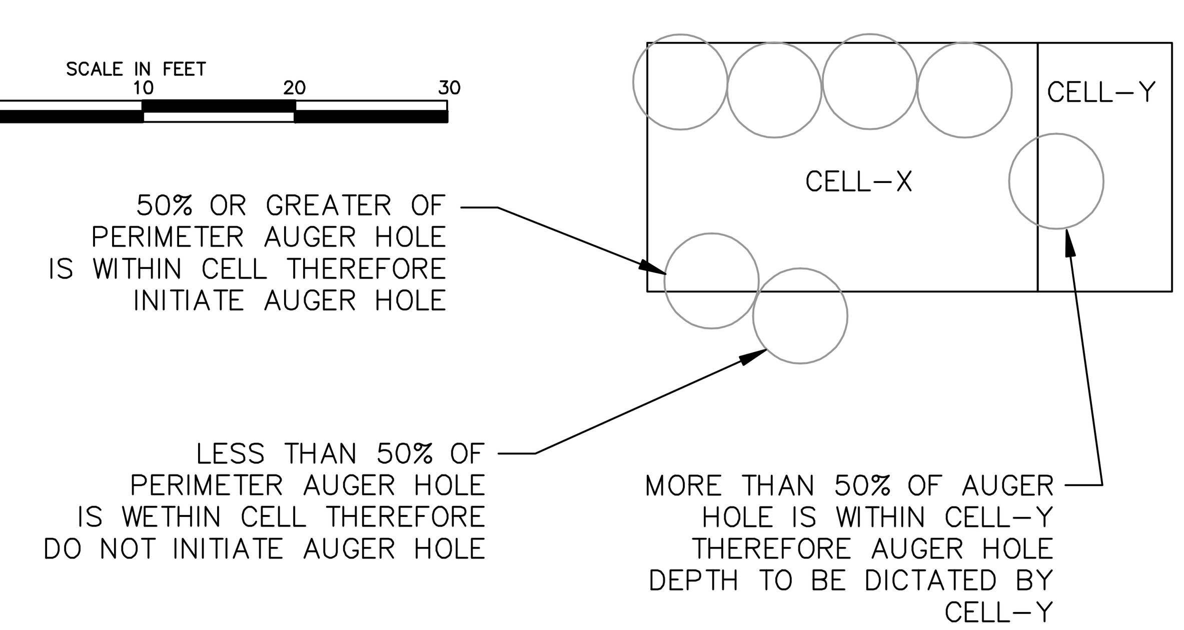
NOTE:

AUGER HOLE PLAN SHOWN BASED ON HYPOTHETICAL 5' DIAMETER AUGER HOLES WITH 1.5' DIAMETER INTERMEDIATE HOLES. SUBCONTRACTOR PROPOSED PLAN SHALL PROVIDE LAYOUT WIYH 95% SOURCE REMOVAL.



LEGEND

- Source Removal Area Boundary
- SB072 Soil Boring ID
- Primary Source Contaminant Exceeds CTL
- Primary Source Contaminant Detected, but does not exceed CTL
- Primary Source Contaminant not Detected
- (23/35/30) Source Removal Area Top (ft.) / Source Removal Area Bottom (ft.) / Depth to Hawthorn (ft.)
- E-23 Cells Label
- Cells Containing RCRA Hazardous Waste > UTS
- Fence
- Property Line



AUGER HOLE PLACEMENT REQUIREMENTS

REVISION NO.	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	PROJECT A/E	APPROVAL

U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO

Work Performed by
S.M. Stoller Corporation
Under DOE Contract
No. DE-AM01-07LM00060

PROJECT LOCATION
Young-Rainey
STAR Center
LARGO, FLORIDA

REFERENCE
REFERENCE NAMES HERE

APPROVALS	DATE
DRAWN BY: J. WHITNEY	6/17/08
ENGINEER: M. MADRIL	6/17/08
PROJECT ENGINEER: M. Madril	6/17/08
APPROVED BY: J. DANIEL	6/17/08
PROJECT MANAGER: J. DANIEL	6/17/08
DOE CONCURRENCE: (SEE RECORD)	

4.5 ACRE SITE / NORTHEAST SITE
SOURCE REMOVAL

PLATE 1
4.5 ACRE SITE
LDA LAYOUT

PROJECT NO. PIN-041-0006-16-000
DRAWING NO. N01209-R00-C03-D+

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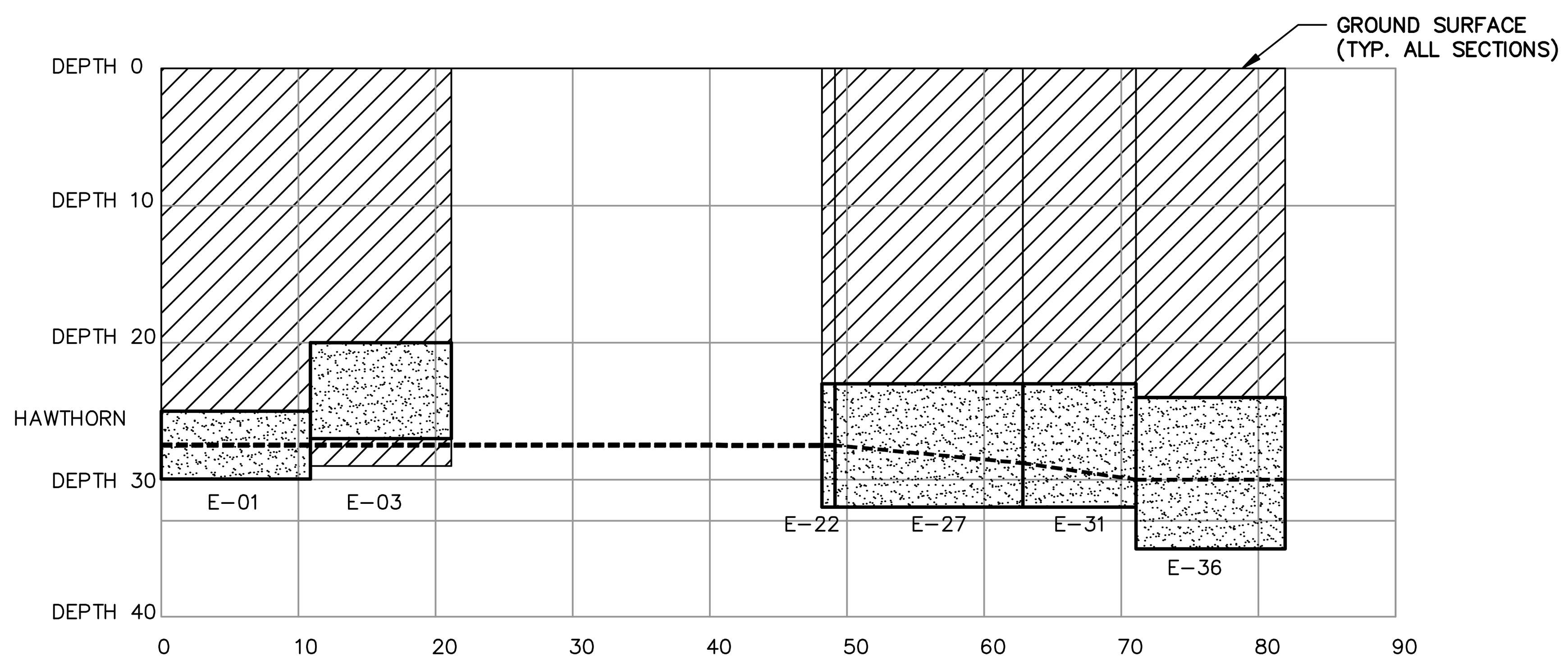
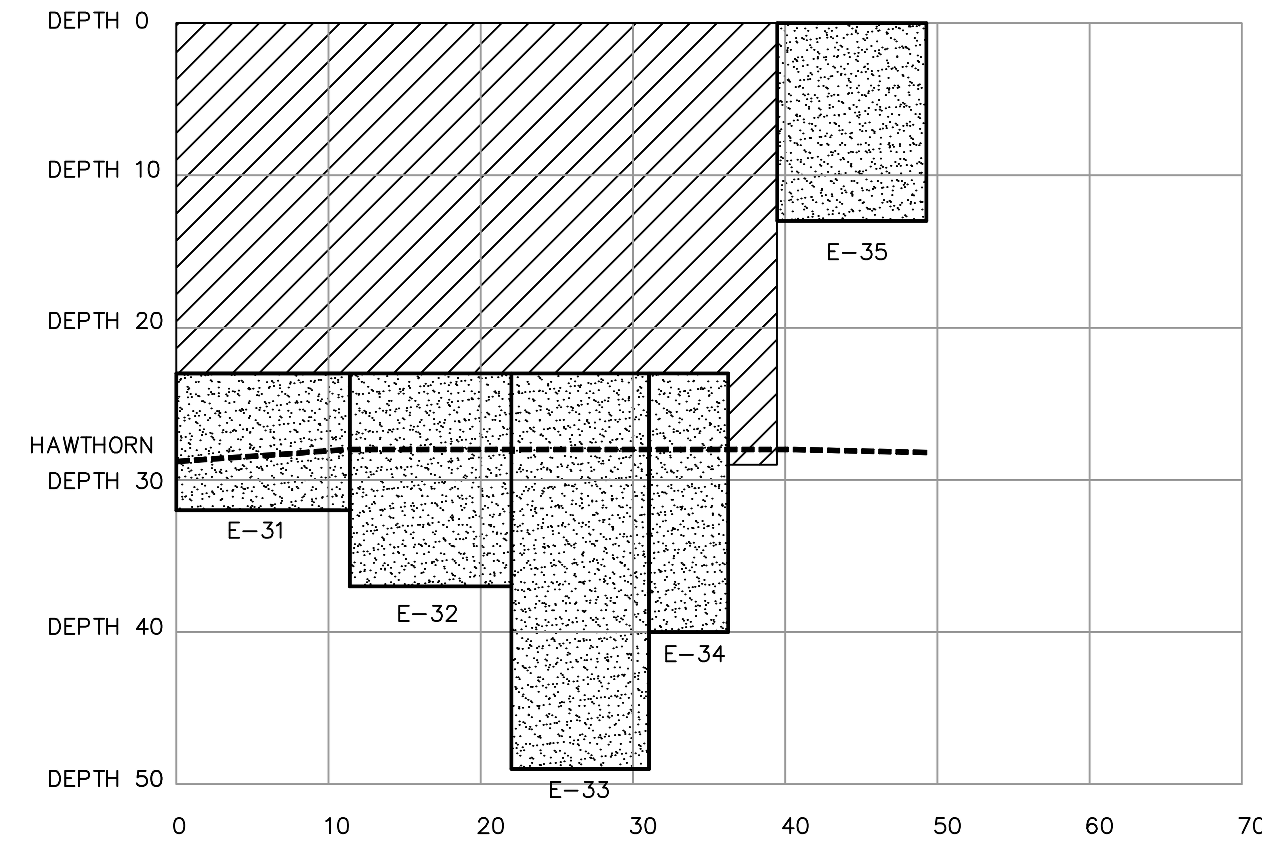
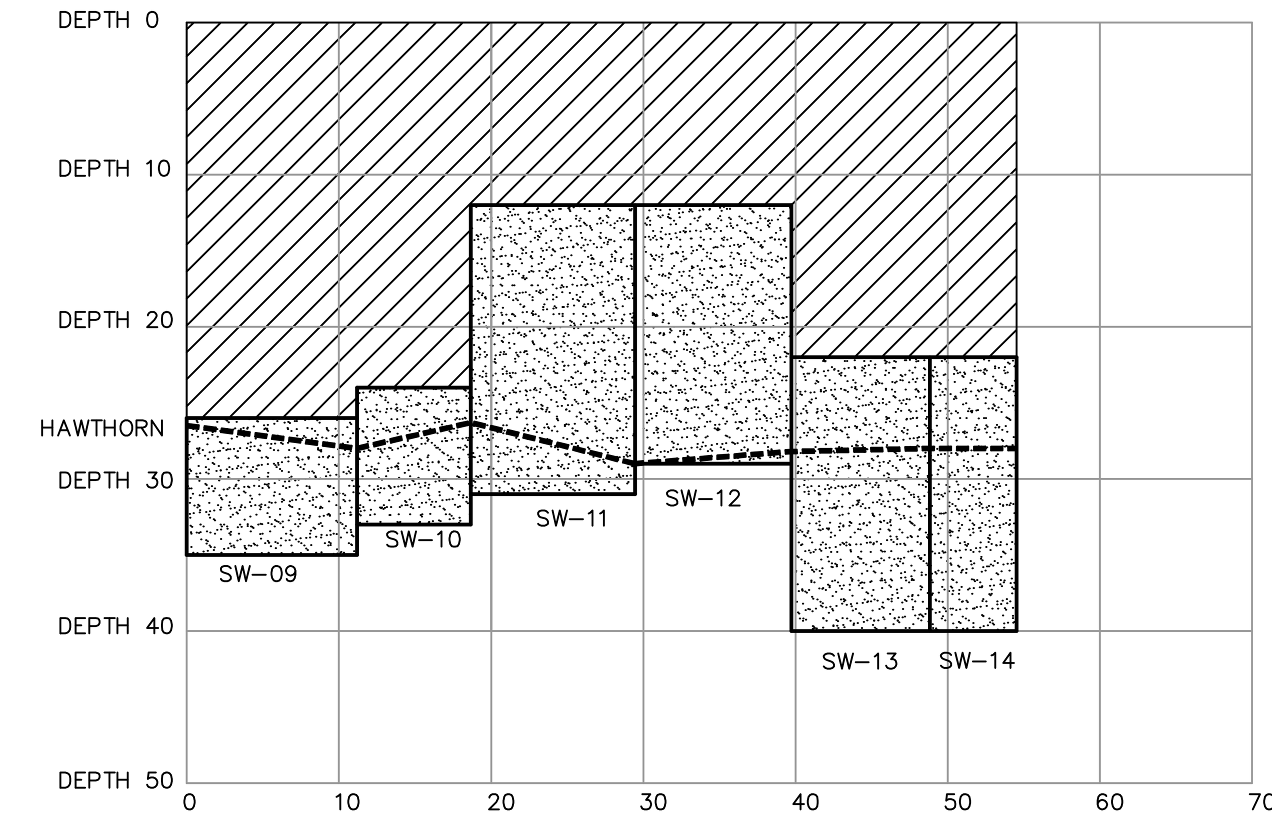


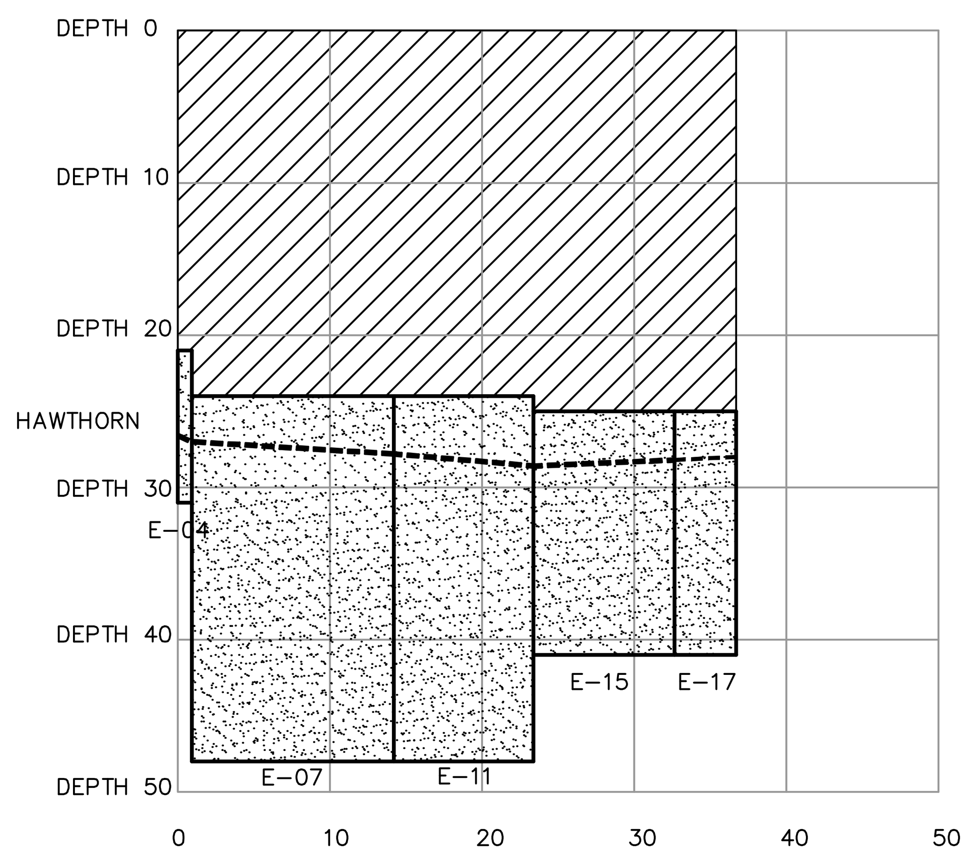
1 4|5 SECTION
SCALE: VERT. 1"=10'
HORIZ. 1"=10'



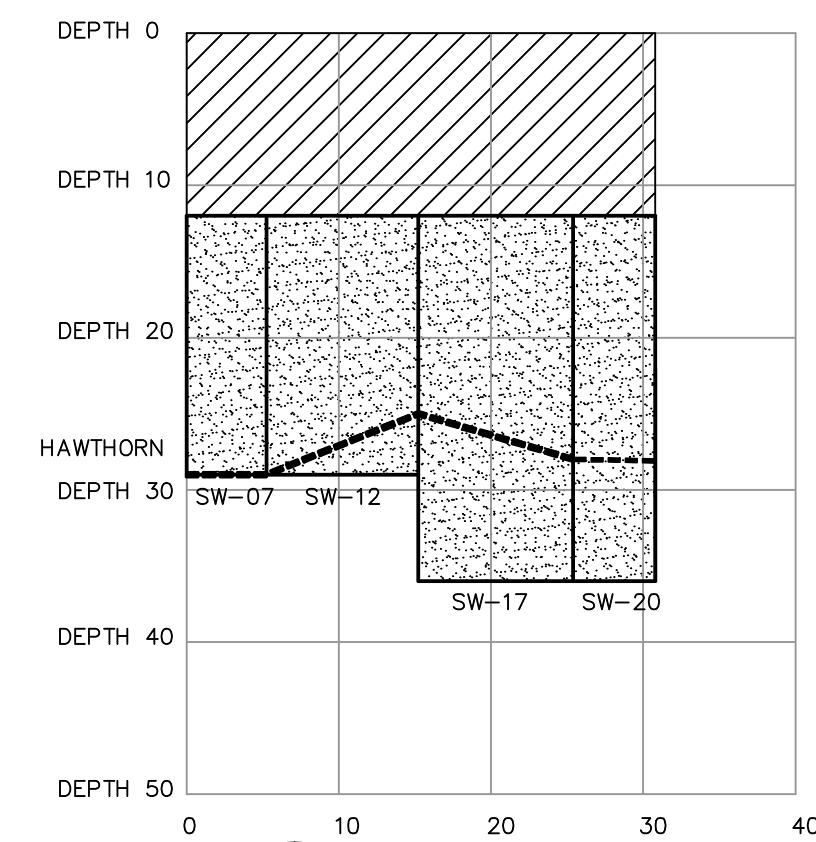
4 4|5 SECTION
SCALE: VERT. 1"=10'
HORIZ. 1"=10'



5 4|5 SECTION
SCALE: VERT. 1"=10'
HORIZ. 1"=10'

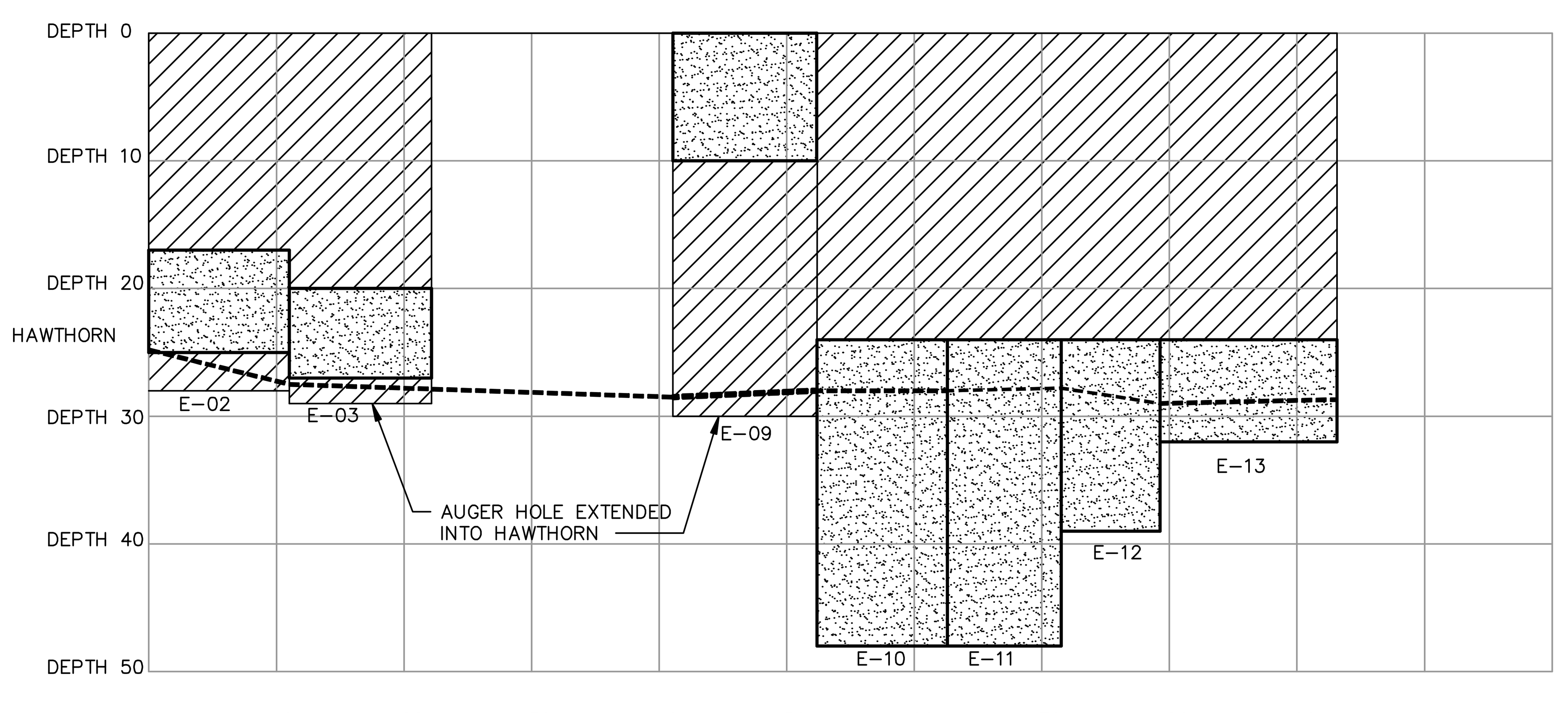


2 4|5 SECTION
SCALE: VERT. 1"=10'
HORIZ. 1"=10'



6 4|5 SECTION
SCALE: VERT. 1"=10'
HORIZ. 1"=10'

SOUTHWEST AREA



3 4|5 SECTION
SCALE: VERT. 1"=10'
HORIZ. 1"=10'

EAST AREA

NOTE:

1. CROSS-SECTIONS REPRESENT CLEAN MATERIAL AND CONTAMINATED MATERIAL AT CELLS NOT AUGER HOLES.

LEGEND

NON-CONTAMINATED AREA

SOURCE REMOVAL AREA

HAWTHORN FORMATION INTERFACE

E-1 CELL LABEL

SW-1 CELL LABEL

REVISION NO.	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	PROJECT A/E	APPROVAL

U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO

Work Performed by
S.M. Stoller Corporation
Under DOE Contract
No. DE-AM01-07LM00060

PROJECT LOCATION: Young-Rainey STAR Center LARGO, FLORIDA

REFERENCE

APPROVALS		DATE
DRAWN BY:	J. WHITNEY	6/17/08
ENGINEER	M. MADRIL	6/17/08
PROJECT ENGINEER	M. Madril	6/17/08
APPROVED BY:	J. DANIEL	6/17/08
PROJECT MANAGER	J. DANIEL	6/17/08
DOE CONCURRENCE	(SEE RECORD)	

4.5 ACRE SITE / NORTHEAST SITE SOURCE REMOVAL

PLATE 2
4.5 ACRE SITE,
LDA REMOVAL, CROSS-SECTIONS

PROJECT NO. PIN-041-0006-16-000

DRAWING NO. N01210-R00-C04-D+

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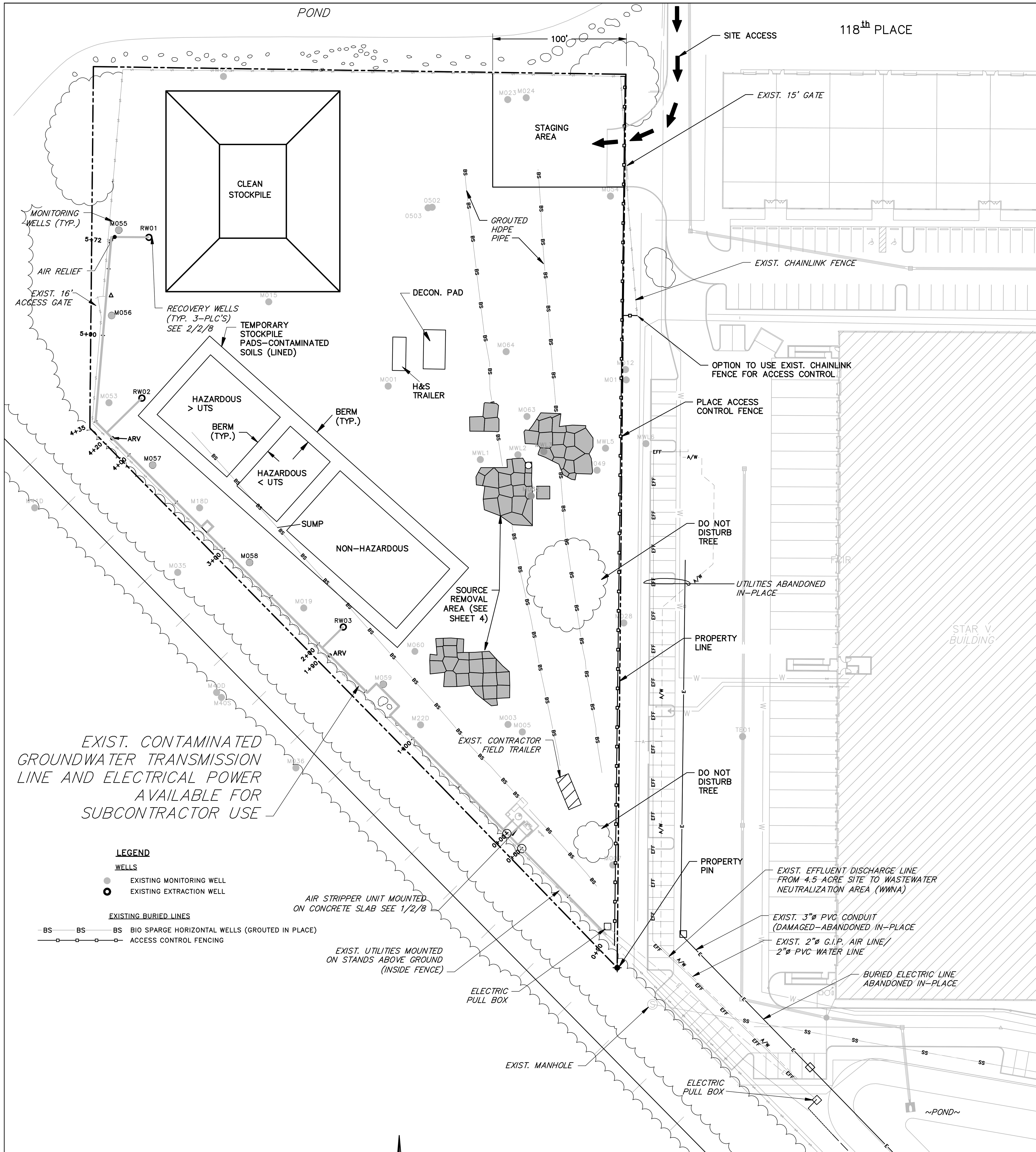


LEGEND

WELLS

- EXISTING MONITORING WELL
- EXISTING EXTRACTION WELL

EXISTING BURIED LINES

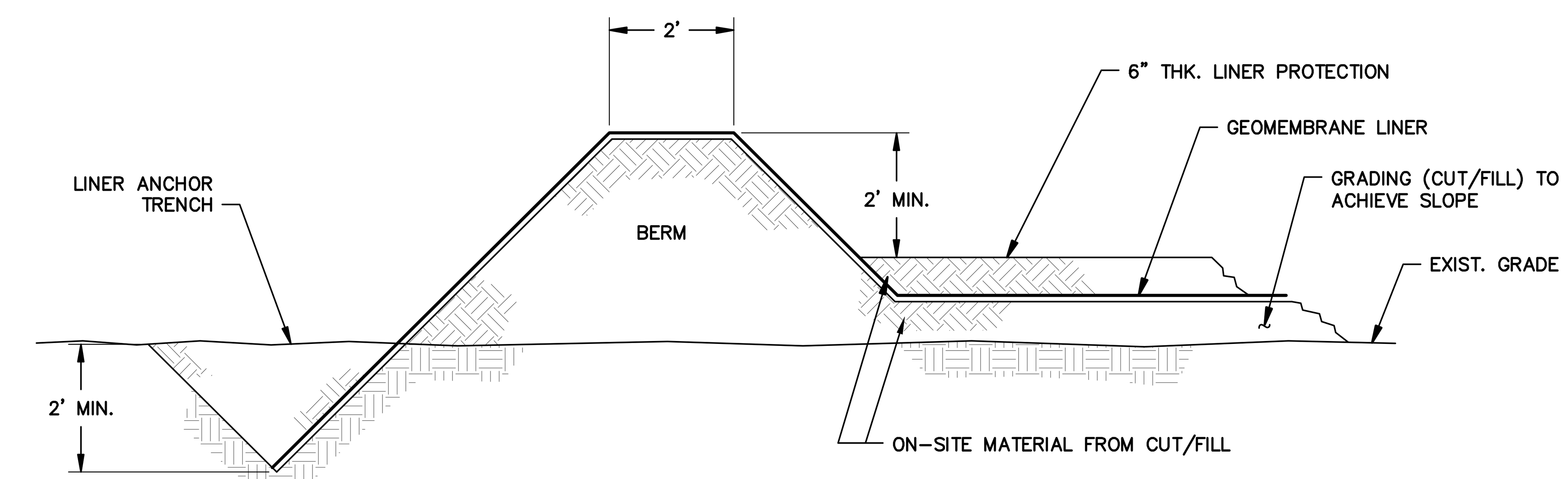
- BS — BIO SPARGE HORIZONTAL WELLS (GROUTED IN PLACE)
- ACCESS CONTROL FENCING

SITE PLAN

SCALE IN FEET

40 20 0 40 80 120

1"=40'



1/2 2 **STOCKPILE PAD SECTION (CONCEPTUAL)**

NTS

NOTE:

1. EXISTING MONITORING WELLS TO BE ABANDONED BY CONTRACTOR BASED ON SUBCONTRACTORS APPROVED SITE LAYOUT.
2. DRAWING PRESENTS EXISTING SITE INFRASTRUCTURE AND A CONCEPTUAL LAYOUT OF MINIMUM INFRASTRUCTURE REQUIREMENTS TO BE PROPOSED BY SUBCONTRACTOR.
3. EXISTING INFRASTRUCTURE IS AVAILABLE FOR SUBCONTRACTOR USE. SUBCONTRACTOR IS RESPONSIBLE TO EVALUATE AND MODIFY OR REPAIR TO MEET PROJECT NEEDS.

REVISION NO.	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	PROJECT A/E	APPROVAL

U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO

Work Performed by
S.M. Stoller Corporation
Under DOE Contract
No. DE-AM01-07LM00060

PROJECT LOCATION: Young-Rainey STAR Center LARGO, FLORIDA	APPROVALS	DATE	4.5 ACRE SITE / NORTHEAST SITE SOURCE REMOVAL
	DRAWN BY: J. WHITNEY	6/17/08	
	ENGINEER: M. MADRIL	6/17/08	PLATE 3 4.5 ACE CONCEPTUAL SITE LAYOUT
REFERENCE: REFERENCE NAMES HERE	PROJECT ENGINEER: M. Madril	6/17/08	
	APPROVED BY: J. DANIEL	6/17/08	
	PROJECT MANAGER: J. DANIEL	6/17/08	PROJECT NO. PIN-041-0006-16-000
	DOE CONCURRENCE: (SEE RECORD)		DRAWING NO. N01207-R00-C01-D+

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